The Automobile

Vol. XXXIV, No. 8

NEW YORK, FEBRUARY 24, 1916

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Jeffery

NEXT WEEK

A New Six - - - -

A Car of Spectacular Performance

- - - - - - - - -

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The Thomas B. Jeffery Company
Main Office and Works. Kenosha. Wisconsin
Builders of Motor Cars Since 1902

80% Less Friction

Almost Doubles the Endurance of the

HUDSON SUPER SIX TRADE NAME REG.

$1375
at Detroit

Patented by Hudson
December 28, 1915
Patent No. 1165861

Hudson Super-Six

A Small, Light Six Delivers 76 Horsepower

THE Super-Six motor has a cylinder capacity of 288 cubic inches.

This size develops some 85 horsepower. But heretofore, at its best, it delivered 42 horsepower. Some 50 per cent was lost in vibration and friction.

The Super-Six delivers 76 horsepower. In this patented motor only 10 per cent is lost in vibration. Thus friction loss is reduced 80 per cent. And that gives to the motor almost double endurance.

JUST WASTED POWER

This extra 34 horsepower is simply power that heretofore was wasted. We have added no cylinders or size. We have not increased fuel consumption.

All the advantage of the Super-Six lies in its utter smoothness. It shows in bird-like motion. The motor is small and light —same size as the Hudson Six-40. It is very economical because of the saving in friction. Rarely does this motor run at more than half load. And the engine wear is almost eliminated.

NOW SUPREME

It must be conceded that the Super-Six motor makes the Hudson car supreme. It has broken all stock car records.

No other type—Six, Eight or Twelve—can approach the Super-Six in performance.

You can prove this by one ride. The Super-Six feats will amaze you. You never saw such effortless performance, such flexibility, such quick response.

No man can doubt that the Super-Six is the greatest motor built. And the luxurious bodies on this new Hudson make the car look its supremacy.

A BASIC PATENT

Note that the Super-Six is controlled by a basic patent. There is nothing else like it. Any man who wants this reserve power, this smoothness, this endurance, must buy a Hudson to get them.

And men will want them. If you don't think so, try a ride in the Super-Six.

7-Passenger Phaeton, $1375 at Detroit.

Five Other Styles of Bodies

HUDSON MOTOR CAR COMPANY
Detroit, Michigan

World's Record Breaker

All Records up to 100 Miles

These tests were made at Sheepshead Bay with a 7-passenger Super-Six — a touring stock car — under official supervision of American Automobile Association.

100 miles in 80 min., 21.4 sec., averaging ***74.67 miles per hour,*** with driver and passenger.

75.69 miles in one hour, with driver and passenger.

Two laps made at 76.75 miles per hour.

Standing start to 50 miles per hour in 16.2 sec. A new record in quick acceleration.

VOL. XXXIV NEW YORK—THURSDAY, FEBRUARY 24, 1916—CHICAGO No. 8

Toledo—Second Automobile City

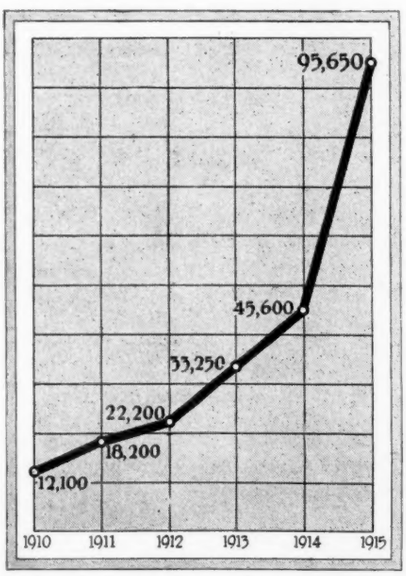
95,650 Cars Left Its Factories in 1915—1000 Electric Systems and 25,000 Spark Plugs Per Day

By L. V. Spencer

TOLEDO is the second automobile city in America. It acknowledges premier position to Detroit, first automobile city of the world. Toledo's rank as second city in automobiledom, to-day the fourth industry in the country, is unique in divers respects. Toledo owes its present automobile status to one manufacturer. Detroit's greatness is in the number and variety of its automobile factories, but Toledo's is in the immensity and concentration of the few. Toledo rose to second place in the last six years; Detroit has held its leadership for more than double that time.

A Rapid Rise

In six brief years Toledo has risen from semi-obscurity as an automobile city until to-day when one-third of its entire army of 75,000 workers is engaged in building automobiles, automobile components and automobile accessories. To-day one-fifth of Toledo's entire army of wage earners is employed by the vast Willys-Overland organization, operating the largest individual automobile factory in the world and occupying second position as the world's greatest producer of automobiles.



Toledo's automobile production since 1910. Note the sharp upward trend in 1915. This is chiefly owing to the expansion of the Overland output

Official figures establish Toledo's rank in second place as an automobile city. In 1915 there were 95,650 automobiles built within its boundaries. Toledo has thirty-five factories connected with the automobile industry, their payrolls constituting a large percentage of the $52,000,000 paid to Toledo wage earners and salaried employees in 1915, although thirty-six new manufacturing institutions of different lines came to the city during the year to help swell the wage and salary total. During 1914, which was somewhat of a time of depression, eighteen plants started operations, whereas in 1913 there were twenty-five.

Population Gains 75,748

Since the automobile industry began to exert its influence on Toledo in 1910 the population of the city has jumped from 168,497 to 244,245, a gain of 75,748.

Bird's-eye view of the great Willys-Overland factories. From a plant of only 300,000 sq. ft. floor area, employing 250 men, in 1908, this 103 acres, employing 15,000 men and building 1000 cars a day

On this basis the growth by 1920 will be about four times what it was for the period from 1900 to 1910 which was 36,675, or from 131,822 to 168,497. In other words, Toledo's population in 1920 may be 390,945. The automobile industry and the business that is allied with it have contributed more than any other single factor to this remarkable growth in population, while Toledo's wealth as well as its population have increased in the past six years far more than they did in any previous period of twice that length.

The increase in the value of the products of Toledo factories almost doubled in the period from 1913 to 1915 as indicated in the tabulation on this page. This increase is largely due to the progress of the automobile and its allied industries although other lines of business in the city have enjoyed somewhat similar growth. The value of Toledo-manufactured products in 1909 was $61,230,000, this practically doubling in 1913, attaining a total of $111,599,000, while the magnitude of increase is shown by the 1915 total of $210,000,000 the value having nearly doubled in the two years' period.

Bank clearings have increased consistently from $186,169,000 in 1908 to $331,579,324 in 1915; while the cost of building construction in the city gained steadily each year over $1,000,000, varying from $2,092,873 in 1908 to $7,622,244 in 1915.

95,650 Cars in 1915

Toledo's increase of production of automobiles has been steady, the ratio of gain rising each year. In 1910 its contribution to the industry was 12,100 cars, increasing to 18,200 in 1911, then to 22,200 in 1912; in 1913 its factories produced 33,250 which was increased to 45,600 in 1914. In 1915, however, the biggest gain took place, the total output being 95,650 or a gain of over 100 per cent as compared with the 1914 figure. For 1916 a production of over 150,000 automobiles is predicted.

Excellent Shipping Facilities

The advantageous position attained by Toledo in an industry that ranks fourth in the United States to-day is not due to any over-night growth, but to steady and solid expansion of its motor car and parts factories that have thrived on the most advantageous kind of manufacturing conditions. Toledo's favorable location as a shipping point, its close proximity to a majority of the markets of the country and the co-operative boosting spirit of its people are factors that are drawing the attention of automobile business men and attracting new industries continually.

Big Accessory Production

There might have been a time several years ago when other motor car producing centers could dispute Toledo's claim to second position, but now the Ohio city has so far outdistanced its nearest rival that such rivalry is a thing of the past. No one now thinks of any automobile city in the world as a sort of understudy to Detroit except Toledo, which during 1915 contributed 95,650 machines to an eager public. Nor is this all. One thousand starting and lighting systems, 25,000 spark plugs and many other parts and accessories were made each day during 1915 by specialists in their lines whose businesses have grown to enormous proportions. Even now these big accessory producers have practically doubled these daily figures of a year ago.

So far as its automobile industry is concerned, at least, Toledo impresses you the same as Detroit. You see enormous factories that only half a dozen years ago were scarcely in

AUTOMOBILES PRODUCED	
1910	12,100
1911	18,200
1912	22,200
1913	33,250
1914	45,600
1915	95,650

POPULATION	
1840	1,222
1850	3,829
1860	13,768
1870	31,584
1880	50,137
1890	81,434
1900	131,822
1910	168,497
1915	244,245

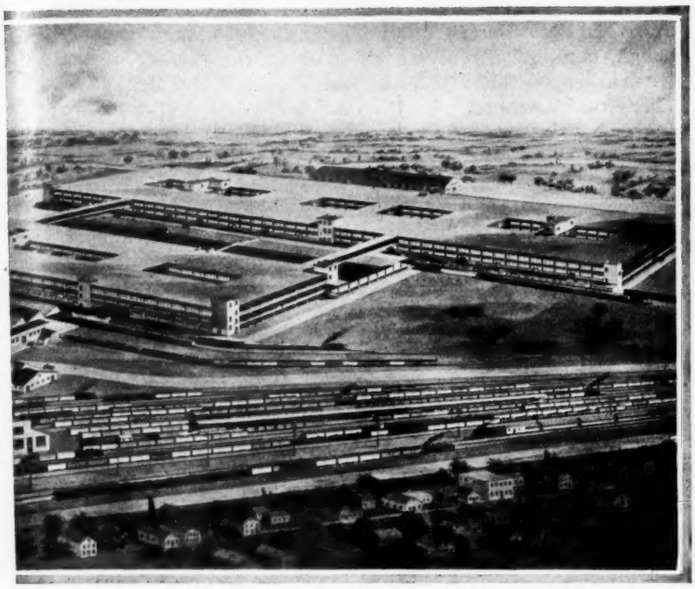
WAGES AND SALARIES	
1899	$6,679,000
1906	10,384,000
1909	13,533,000
1913	22,760,000
1915	52,000,000

FACTORIES OF ALL KINDS BUILT	
1913	25
1914	18
1915	36

BANK CLEARINGS	
1908	$186,169,000
1912	250,594,000
1914	304,459,324
1915	331,579,324

VALUE OF PRODUCTS	
1899	$31,976,000
1904	44,501,000
1909	61,230,000
1913	111,599,000
1915	210,000,000

COST OF BUILDING CONSTRUCTION	
1908	$2,092,873
1910	4,077,735
1912	5,233,912
1914	6,056,800
1915	7,622,244



organization has grown until it occupies factory buildings aggregating

business at all. You see on all sides evidences of a marvelous growth that is so busy taking care of its very bigness that it has not the time to stop and tell you how it was done. Toledo does not care much about the past; does not deal in post mortems, but is looking ever ahead and striving to keep pace with the prosperity and progress that are coming to it in ever-increasing quantities.

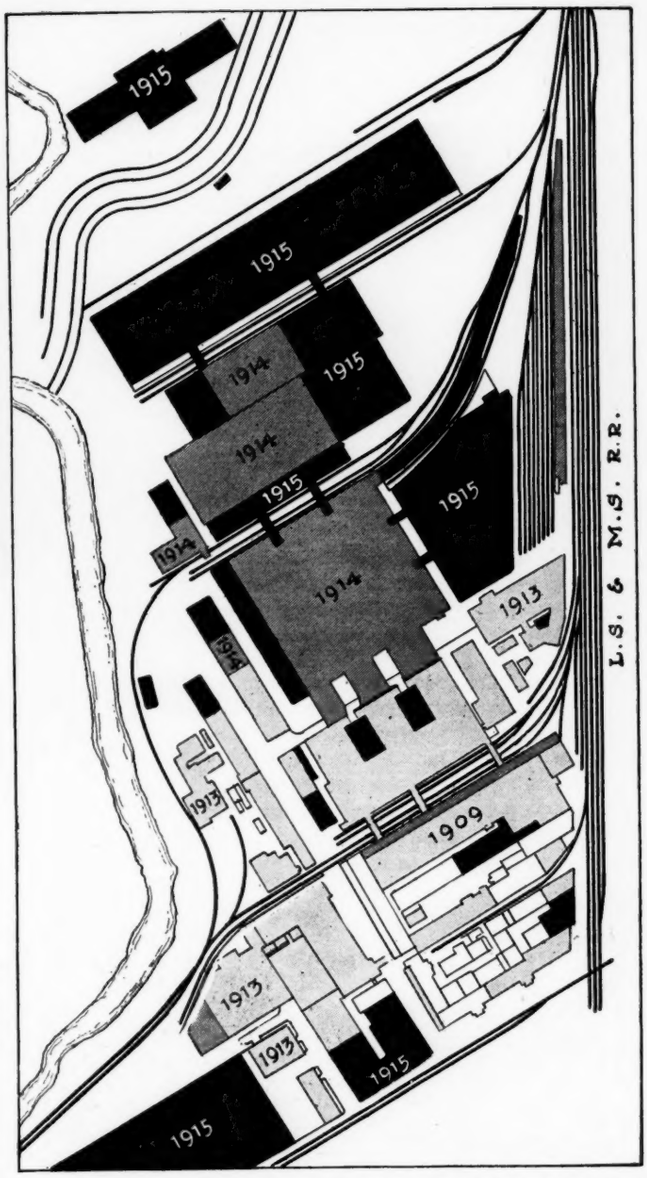
Overland's Phenomenal Rise

From these statistics it will be seen that it was a most fortunate day for Toledo when John N. Willys, wizard of finance and automobile, took serious notice of the thriving Ohio center. It was in 1909 that he purchased the old Pope-Toledo plant and used it as a nucleus around which was destined to be developed the largest single automobile manufacturing institution in the world.

The history of the Overland automobile is like a tale from the Arabian Nights, the only difference being that it is a true story. The name Overland was first applied to an automobile in the fall of 1902, at which time the Standard Wheel Co., Terre Haute, Ind., completed the design of and built a 3½-hp. runabout. A number of these were sold, perhaps a dozen. The following year, the concern succeeded in building and selling seventy-five cars—a large output for that year. But matters did not go very well, and in 1907 the sales of Overland cars, then made in Indianapolis, did not exceed forty. But in January, 1908, Mr. Willys acquired control and took the presidency and the company name was changed to the Willys-Overland Co. This was the beginning of the present great business, and under the able direction of its head the whole administration was reorganized, the first year's business under the new management totaling 465 cars.

1000 Cars a Day

Looking about for a new factory site, Mr. Willys saw the possibilities of Toledo and of the few Pope-Toledo buildings scattered over a 7-acre lot. When he took it over this plant boasted of 300,000 sq. ft. of floorspace and employed 250 men, a factory of no mean size, by the way. Each year since then has seen new buildings spring up in the Overland group until now they have an aggregate floor area of 103 acres, house 15,000 employees and possess a production capacity of 1000 cars a day. Undoubtedly this output will be attained during the present year, for even now the average daily schedule is 700 cars, the record being 722 cars in 24 hr. Some definite



Diagrammatic view of Willys-Overland plants, showing the yearly additions and the excellent railroad facilities

idea of the strides which this great factory has made may be gathered from the following:

OUTPUT BY CALENDAR YEARS—OVERLAND CARS

Year	Cars
1907	40
1908	465
1909	4,000
1910	12,000
1911	18,000
1912	22,000
1913	33,000
1914	45,000
1915	94,437
1916 (planned)	150,000

The diagrammatic map of the Overland factory will perhaps best illustrate how the expansion has been kept up steadily to meet the increasing demand for cars. The greatest single year's increase was during the last twelve months, when 1,765,840 sq. ft. were added.

Naturally such an enormous industrial organization has a big influence upon Toledo, employing as Overland does at the present time one-fifth of the total working population of the city. It has not only been a big factor in the rapid advancement of the population, but it has logically served to attract

other factories making parts and accessories, and has served to show what the latent possibiilties of the city as a manufacturing center are.

The result has been a gradual increase in the number of establishments dependent either wholly or in part upon the automobile trade, for they know that here they can get experienced automobile labor, can secure co-operation from others in the industry and can have adequate shipping facilities. The same economic reasons are back of the growth of Toledo as an automobile center as are back of the concentration of the rubber goods and tire-making industry at Akron, and the centering of the iron and steel industry at Pittsburgh.

Thirty-five plants are now operating in Toledo that are allied with the automobile. Not all of them are to be regarded as exclusively motor vehicle or parts factories, but a majority are dependent upon the automobile business entirely. In them are working approximately 24,000 persons—one-third of the whole working class of the city. Is it any wonder the industry has meant much to Toledo?

50,000 Spark Plugs Daily

There is, for example, the Champion Spark Plug Co., which has made a striking success of concentration upon one thing alone—the spark plug. The daily output now ranges from 40,000 to 45,000 plugs requiring 300 persons with the aid of the most modern kinds of special machinery to do it. Beginning in a minute plant in May, 1910, with twenty-five employees and pushed to its utmost to make 2000 plugs a week, this concentrated organization has now outgrown a modern four-story factory building and is erecting a six-story addition as well as adding two stories to its main plant, so that, when completed 55,000 sq. ft. will be provided.

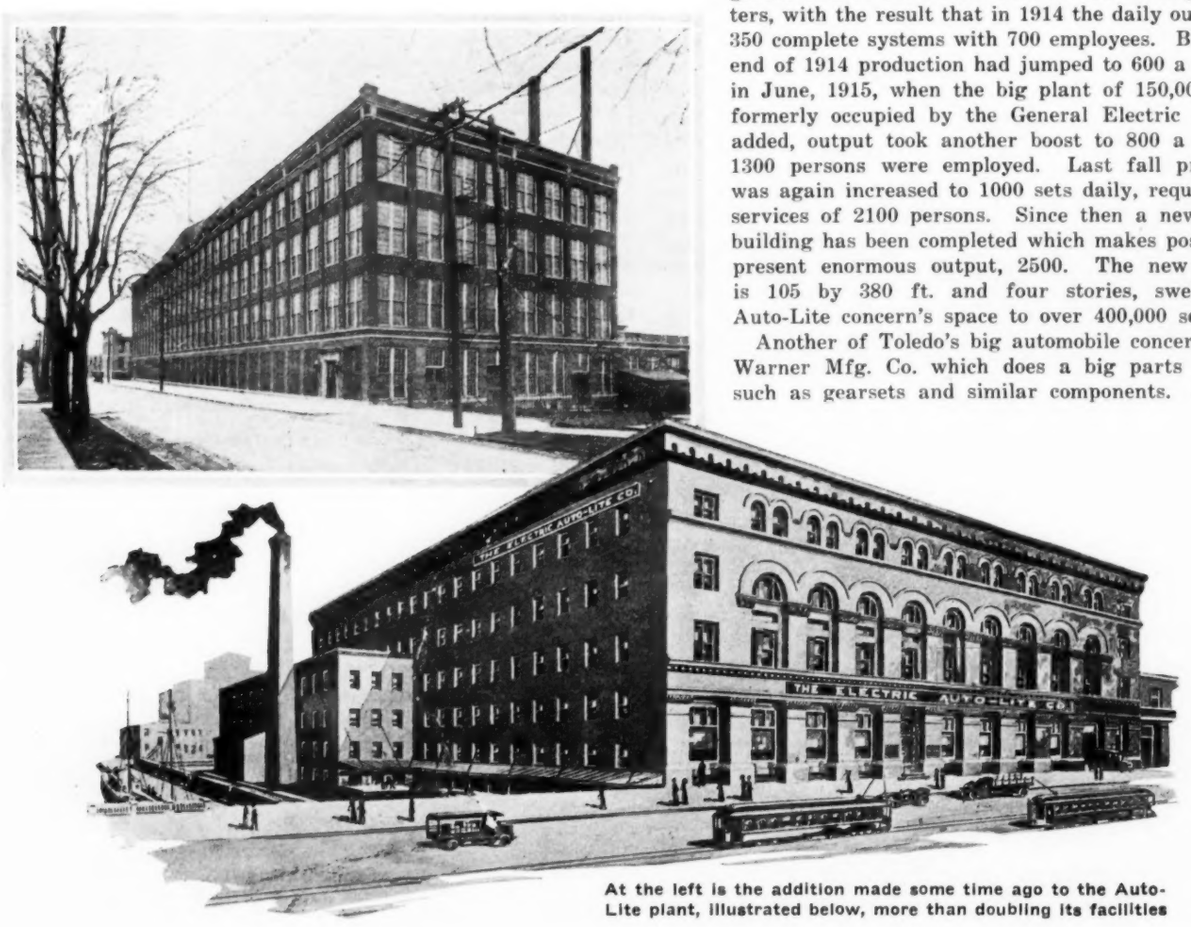
Toledo has two other big makers of motor vehicles. These are Milburn and Ohio concerns, both of which build electric cars. The Ohio Electric Car Co. began in 1910, and strangely enough, occupied at the start a part of the factory of the Milburn Wagon Co., which has long been one of Toledo's big industries. That first year Ohio succeeded in building twelve cars and had ten men on its payroll. In 1912 the present large plant was built which has a three-story main building 60 by 340. Later other buildings were added, each two stories high, one measuring 60 by 240 ft. and the other 80 by 160. The factory has a yearly output of 600 vehicles, and employs 250 men.

The Milburn Wagon Co. launched into the electric automobile business December, 1914, and during last year turned out 600 cars. These are of the light type and have struck out in a new direction so far as electric design is concerned. This year, the Milburn production plans call for 1200 cars, and judging from the business reported for January and the month previous, this figure will be readily attained. Although Milburn makes wagons as well as electric cars, the addition of the motor vehicle has meant an increase in the payroll from 400 to 800 men, and at present they are working 14 hr. a day.

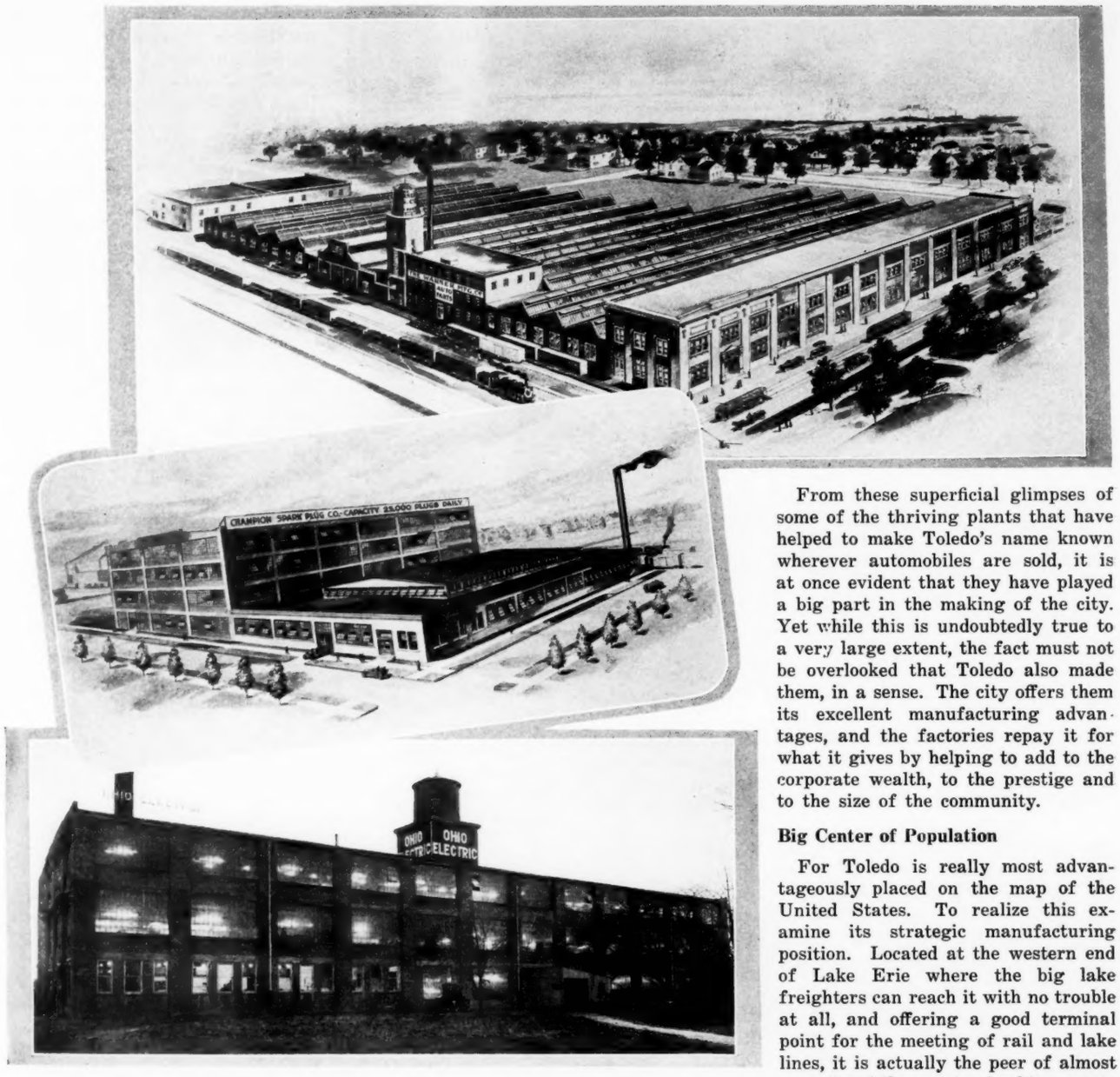
2500 Electric Systems a Day

Concentration has also played an important part in the wonderful growth of the Electric Auto-Lite Co., which now has a daily output of 2500 complete electric starting and lighting systems. Close to the Overland plant, one of its main users, this factory has grown from an original production of ten lighting generators a day, at that time no starting units being built. Fifteen men drew their pay from Auto-Lite then. Production was stepped up to twenty-five generators early in 1912, then to fifty generators and fifty starters in 1913. But the original plant was soon outgrown and in 1914 Auto-Lite moved to larger quarters, with the result that in 1914 the daily output was 350 complete systems with 700 employees. Before the end of 1914 production had jumped to 600 a day, and in June, 1915, when the big plant of 150,000 sq. ft. formerly occupied by the General Electric Co., was added, output took another boost to 800 a day and 1300 persons were employed. Last fall production was again increased to 1000 sets daily, requiring the services of 2100 persons. Since then a new factory building has been completed which makes possible the present enormous output, 2500. The new building is 105 by 380 ft. and four stories, swelling the Auto-Lite concern's space to over 400,000 sq. ft.

Another of Toledo's big automobile concerns is the Warner Mfg. Co. which does a big parts business, such as gearsets and similar components. Since its



At the left is the addition made some time ago to the Auto-Lite plant, illustrated below, more than doubling its facilities



Upper—Plant of the Warner Mfg. Co. This company is a large producer of gearsets and similar components. Its working force is now 600 to 700 men

Middle—Plant of the Champion Spark Plug Co., an organization which has grown from a small establishment, employing twenty-five persons in 1910, with a weekly output of 2000 plugs, to a large plant with 300 employees, turning out from 40,000 to 45,000 plugs per day

Below—Factory of the Ohio Electric Car Co., which manufactures 600 electric cars per year and gives employment to 250 men

inception seven years ago this factory has enjoyed a 75 per cent business increase. The start was made with 200 men, but now it employs 600 to 700.

As an example of intelligent management, and good product in combination with Toledo's facilities for the manufacturer, the case of the McNaull Tire Co. can be cited. Starting not over one year ago, this concern is now located in a 50 by 220 factory with a capacity of 100 tires a day and employs seventy men.

Others that are growing rapidly and which have wisely chosen Toledo in which to cast their lot are the Bock Bearing Co.; Dewey, Anderson Mfg. Co.; Mather Spring Co.; Bunting Brass & Bronze Co.; Doehler Die-Casting Co.; Miller Storage Battery Co.; Seiss Mfg. Co.; Gendron Wheel Co., etc.

From these superficial glimpses of some of the thriving plants that have helped to make Toledo's name known wherever automobiles are sold, it is at once evident that they have played a big part in the making of the city. Yet while this is undoubtedly true to a very large extent, the fact must not be overlooked that Toledo also made them, in a sense. The city offers them its excellent manufacturing advantages, and the factories repay it for what it gives by helping to add to the corporate wealth, to the prestige and to the size of the community.

Big Center of Population

For Toledo is really most advantageously placed on the map of the United States. To realize this examine its strategic manufacturing position. Located at the western end of Lake Erie where the big lake freighters can reach it with no trouble at all, and offering a good terminal point for the meeting of rail and lake lines, it is actually the peer of almost any city of the country in this respect. Half the population of the United States is within a radius of 500 miles, and it is perhaps this fact as much as anything else that has attracted manufacturers.

But this great central location could be discounted somewhat were it not that Toledo is blessed with twenty-three steam and electric railroad lines, tapping nearly every section of the country. A salient point about the entire railroad situation is the terminal belt railroad that extends entirely around the city and has direct track connections with all roads that enter. The advantage of this for quick transfer of shipments from any spur track to any main line is apparent.

Five Steamship Lines

But in addition to this remarkable array of railroads, Toledo also is fortunate in being the terminus of five regular steamship lines of the Great Lakes, besides having a dozen interurban trolley lines whose main business is passenger traffic.

As a further indication of Toledo's industrial position, the

Where Toledo's land and water shipping meet. The New York Central freight house, with a view of some of the wharves

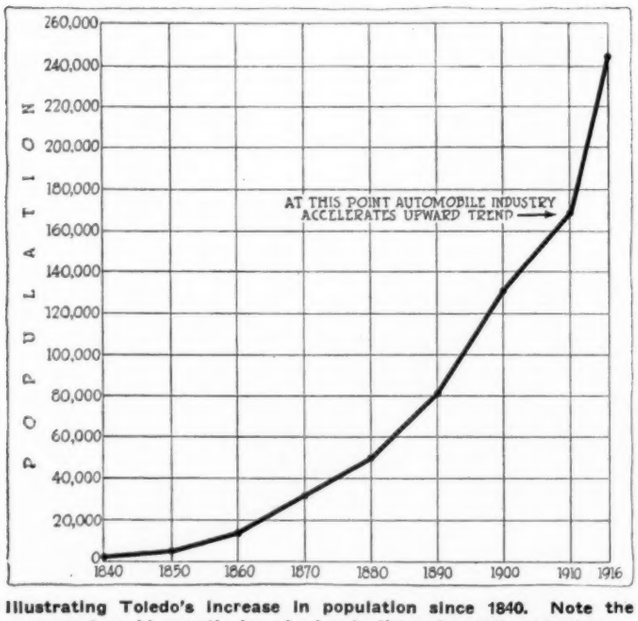
harbor is of special interest. A natural haven, it has been made of immense commercial value by extensive improvements so that the straight channel now is 21 ft. deep and 400 ft. wide, sufficient for the largest freighter. Being the connecting link between lake and rail, the city has received a wonderful coal-and-iron-ore-carrying trade, as well as an enormous grain jobbing business, which during last year swelled to a value of $90,000,000.

These facts are cited to show why the city has been picked as a logical location for centralization of automobile production. The railroads have been quick to realize the strategic position of the city, and they have built adequate dock and terminal facilities, some of them combining their land freight sheds with their lake dockage facilities.

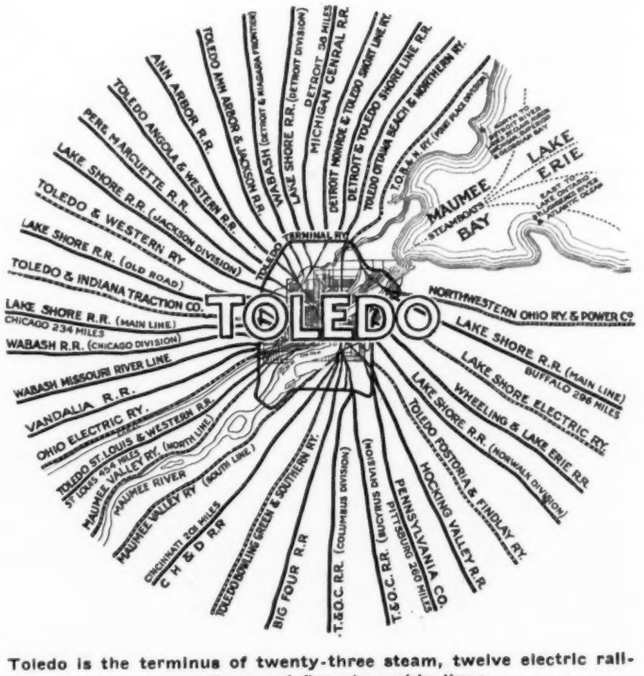
As a retail center, particularly for the sale of automobiles, Toledo is well situated. The same shipping facilities, commercial advantages and wealth that make it an ideal manufacturing community, work to the distinct advantage of the dealer or distributor of cars. That Toledo is a logical center for the distribution over a wide territory is proved by the fact that some of the largest automobile builders have allotted big areas to their distributors here. The five largest distributors alone have contracted for 15,850 cars to sell in their Ohio territories in and around Toledo during 1916. The largest distributor in the city, for instance, who handles a popular-priced car, has a territory covering all of Ohio with the exception of Cleveland, and including West Virginia, Kentucky, four counties in Michigan, nine in Indiana and eight in Virginia. Thus, so advantageous does his factory, which is in another city, consider Toledo as a distributing point that it has allowed him an enormous field radiating from it. This distributor, by the way, has contracted for 5000 cars this year.

Further Facts Are Needless

It is needless to go further with facts and figures to show the great advantage of Toledo as a commercial center. It speaks much for the farsightedness and business acumen of men in the automobile industry that they have picked out a city which is destined to play so important a part in the industrial history of our country, and these will help Toledo as Toledo helps them, for as the city grows so shall develop the men who are a part of it.

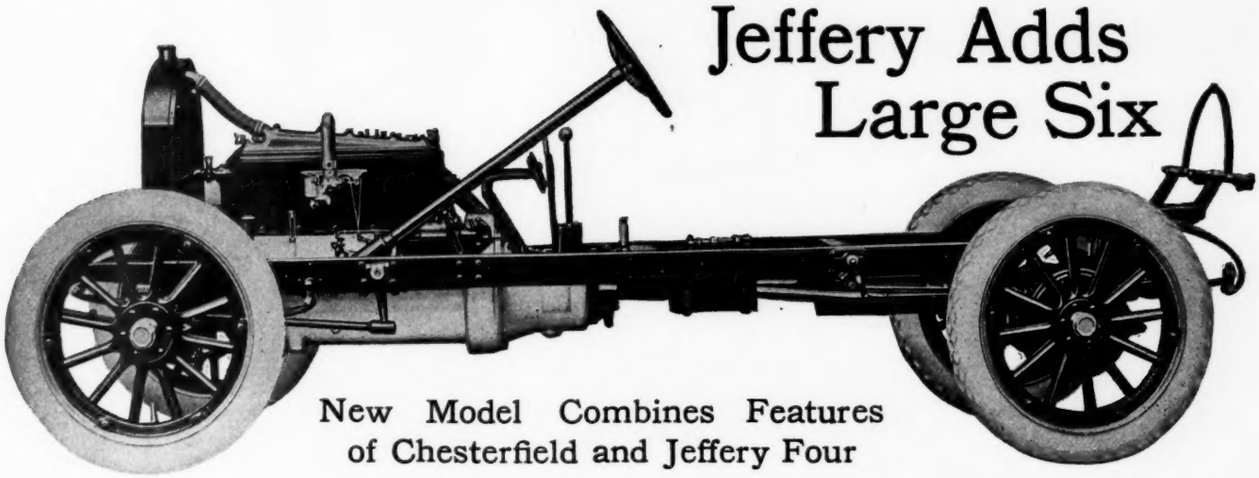


Illustrating Toledo's increase in population since 1840. Note the recent rapid growth, largely due to the automobile industry


TOLEDO
MAUMEE BAY
LAKE ERIE
TOLEDO ANN ARBOR & NORTHERN RY.
ANN ARBOR R.R.
TOLEDO ANN ARBOR & JACKSON RY.
WABASH (DETROIT & KALAMAZOO FRONTIER)
LAKE SHORE R.R. (DETROIT DIVISION)
DETROIT 58 MILES
MICHIGAN CENTRAL R.R.
DETROIT & TOLEDO SHORE LINE R.R.
TOLEDO ANGOLA & WESTERN R.R.
PERE MARQUETTE R.R.
LAKE SHORE R.R. (JACKSON DIVISION)
TOLEDO & WESTERN RY.
LAKE SHORE R.R. (OLD ROAD)
TOLEDO & INDIANA TRACTION CO.
LAKE SHORE R.R. (MAIN LINE)
CHICAGO 234 MILES
WABASH R.R. (CHICAGO DIVISION)
WABASH MISSOURI RIVER LINE
VANDALIA R.R.
OHIO ELECTRIC RY.
TOLEDO ST. LOUIS & WESTERN R.R.
ST. LOUIS 454 MILES
MAUMEE VALLEY RY. (NORTH LINE)
MAUMEE RIVER
MAUMEE VALLEY RY. (SOUTH LINE)
CINCINNATI 203 MILES
C. H. & D. R.R.
TOLEDO BOWLING GREEN & SOUTHERN RY.
BIG FOUR R.R.
T. & O. C. R.R. (COLUMBUS DIVISION)
T. & O. C. R.R. (MICHIGAN DIVISION)
PENNSYLVANIA CO.
PITTSBURG 260 MILES
HOCKING VALLEY R.R.
TOLEDO FOSTORIA & FINDLAY RY.
LAKE SHORE R.R. (NORWALK DIVISION)
WHEELING & LAKE ERIE R.R.
LAKE SHORE ELECTRIC RY.
LAKE SHORE R.R. (MAIN LINE)
BUFFALO 296 MILES
NORTHWESTERN OHIO RY. & POWER CO.
T. & O. C. R.R. (PORT CLINTON DIVISION)
TOLEDO & ORTHAN BEACH R.R.
DETROIT & TOLEDO SHORE LINE R.R.
TOLEDO TERMINAL RY.
STEAMBOATS

Toledo is the terminus of twenty-three steam, twelve electric railroad lines and five steamship lines

Jeffery Adds Large Six



New Model Combines Features of Chesterfield and Jeffery Four

THE Thomas B. Jeffery Co., Kenosha, Wis., has just begun delivery of a new six-cylinder car, model 661. This is more modern in design and larger in size than the Jeffery Chesterfield, the previous six, and with the Jeffrey four, which has been on the market for some time, will comprise the chief unit in the Jeffery passenger car program.

The new six to be marketed as a seven-passenger tourist at $1,450 is externally a very up-to-date car, having a much more pronounced roll inward to the sides than has been characteristic of previous Jeffery designs, and with a straight line from radiator to windshield and smooth hood and cowl becomes the very latest exemplification of the marine motif in motor car superstructure. The radiator is narrow and unusually high, so that it is possible to combine the modish horizontal hood line with a downward sweep to the roll edge of the passenger compartments and at the same time provide a very roomy car. With the wheelbase of 120 in. a very roomy tonneau is provided and one which is uncluttered by spare seats, for when the latter are not in use they fold forward into the backs of the forward seats. The latter are divided, giving the vestibule type of seating arrangement, which permits unimpeded communication between forward and rear compartments.

As compared with the previous six, the new car incorporates a number of changes mechanically. In most of these a design which has been found to work out well with the four has been followed, rather than that incorporated in the Chesterfield six, and as the four is a much more modern model, it is to be assumed that from the standpoint of Jeffery design in general the alterations in the new six are along the lines of progress.

Hotchkiss drive used with three-quarter spring

There is an increase in motor dimensions to 3½ by 5¼ in., which is ½ in. greater bore and a ¼ in. longer stroke than possessed by the former six and gives a piston displacement of 333 cu. in., which is 50 per cent greater than that of the former six.

The new six, too, marks the complete conversion of the Jeffery passenger cars to spiral bevel drive, a design employed in the four and a departure from the practice in former six which included a worm drive in its specifications. Likewise cantilever springing which was a feature of the earlier six-cylinder car has given way to three-quarter elliptic rear suspension. In this respect the new six is similar to the four.

Braking incorporates a design which has proved successful in the four-cylinder car, namely, that is the location of the emergency brake on a drum at the rear of the gearset operating directly on the drive shaft. This gives a very direct and positive application of the emergency brake through short linkages and goes very far toward making an exceptionally clean looking chassis. With the connections to the service brakes carried outside of the frame and springs where they are accessible for adjustment and oiling, there is nothing left within the rear of the exceedingly clean frame except the propeller shaft.

A feature is the very neat arrangement of the drive to the Van Sicklen speedometer. Instead of the two pulleys and belt from the driveshaft previously used, a special gear is provided which meshes with the secondary gear in the gearset. This operates the speedometer drive and is completely inclosed within the gearbox where it is supplied automatically with the oil in the latter. Special attention, too, should be called to the unusually neat accelerator pedal which is a rocker type and provides not only easy foot action, but very simple and positive connection with the throttle.

Details of Engine

To take up the design of the car in detail: The block cast, L-head, motor has both the upper and lower halves of the horizontally split crankcase made of aluminum. The valves and consequently the camshaft are on the right side and the lay shaft, which drives in succession the water pump, air pump, generator and magneto, is utilized along every inch of its length but without such crowding as to make any of the accessories inaccessible.

The pistons are iron 5½ in. in length with pins 1 5/64 in. in diameter; eccentric piston rings are used. Connecting rods are forgings 11¼ in. long, their caps being fastened by

two chrome nickel steel bulbs. Phosphor bronze piston pin bearings are located within the piston. The crankshaft is 35 to 25 carbon steel and turns on four die-cast babbitt bearings, the two center ones being 2 by 2¼ in. The front 1¾ by 2⅞ and the rear 2⅛ by 3¼ in. The valves have a lift of 5/16 in. in the clear, both being 1 11/16 in. in diameter and made of tungsten steel. The camshaft is a forging with the cams intregral and tappets of mushroom type.

The valve timing of the motor is as follows:

Inlet opens 5 deg. late.

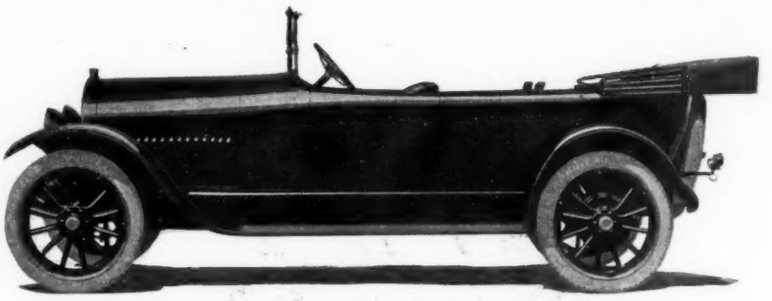
Inlet closes 45 deg. late.

Exhaust closes 5 deg. late.

Exhaust opens 55 deg. early.

The timing gears are helical with a 26-deg. helix and a 10 pitch. The gears all 1⅛ in. across the face, which should be sufficient to give long life before backlash or wear develops. The motor complete with its control parts, complete with fan, carbureter, magneto, starter and generator weighs 700 lb. according to factory specifications. The firing order of the engine is 1, 5, 3, 6, 2, 4, and ignition is cared for by a Dixie magneto.

Lubrication is a circulating system maintained by a gear pump, from an oil reservoir which is located beneath the crankcase and forced through a pipe to the top of the main bearings. From the main bearings, the oil overflows into the bottom of the crankcase into which the connecting rods dip. These pockets have overflow holes in one side which allow the oil to drain back into the reservoir beneath, so that a constant level of oil is maintained. An indicator which shows at all times the level of the oil in the reservoir is placed beside the combination breather and filling tube. The oil pump and strainer are removable from the bottom of the crankcase for cleaning without disturbing the other parts. A separate lead to the timing gears provides a constant stream of oil from the pump for these. The circulation of cooling water is by means of a pump on the lay shaft and a two-bladed aeroplane propeller type of fan is employed.



Jeffery Big Six

Jeffery Big Six Chassis

Vacuum Fuel Feed Used

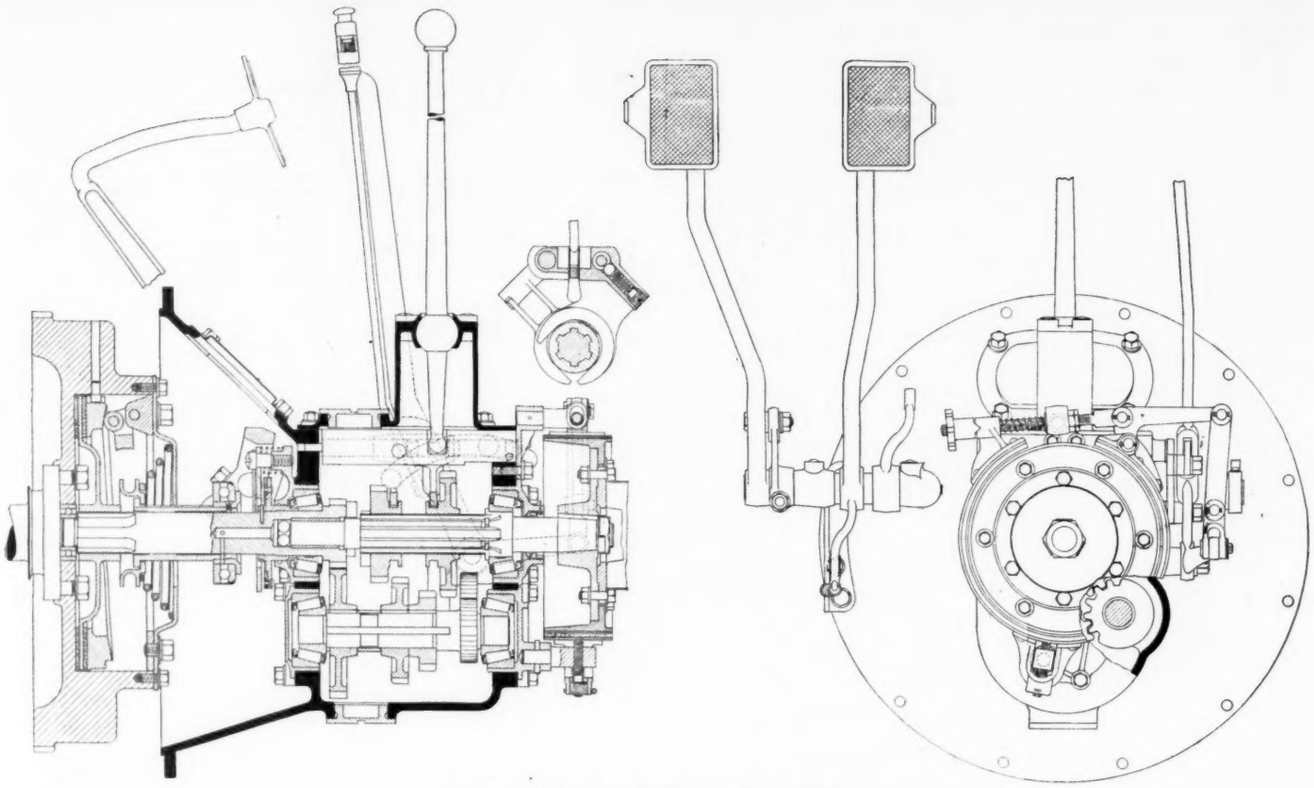
Carburetion is by means of the new model L. B. Stromberg carbureter of the horizontal type bolted directly to the cylinder casting and heated by hot air drawn from around the exhaust manifold. As the exhaust header is on one side of the engine and the carbureter on the other, the hot air is taken through a pipe which goes over the top of the cylinder. Fuel feed from the rear tank is supplied by means of a Stewart vacuum gravity system.

Starting and lighting is taken care of by a Bijur generator and a Bijur motor, which are separate units. A single wire or grounded system is used and the starting motor is geared to the flywheel by a sliding pinion which is shifted into mesh with the flywheel teeth when the starting switch is depressed, giving a cranking speed of 165 r.p.m. The generator is a constant current type with a maximum output of 12 amp. An automatic switch located inside the generator is operated by a third brush. The battery is mounted in a special cradle in the frame in such position that removal of the driver's seat cushion makes it accessible for filling. It is a 6-80 U.S.L.

The clutch is a three-plate type, one steel and two asbestos plates. The gearset gives three speeds forward and is in unit with the motor, the whole power plant being suspended on three points. The gears have a ⅝-in. face and the shafts are mounted on taper roller bearings.

The rear axle is semi-floating, having a malleable iron center with alloy steel tubular ends. With this construction it is not necessary to use a truss rod. Removal of a large cover over the differential housing makes the differential readily removable and accessible for adjustment. The pinion and large driven gear are provided with adjustments for taking up wear.

The frame is pressed steel and provided with four cross members which make it very rigid. The side rails are extended to the rear to provide a support for the gasoline tank and a spare tire. The spare tire carrier is a semicircle instead of the usual complete circle and is held by two quick operated hand locks, one at either end of the horizontal diameter of the tire carrier.



Details of Gearset and Transmission Brake

Provision for locking the spare tire with a padlock is made, a detail likely to be much appreciated.

Tires are 35 by 4½ straight side on Stanwell demountable rims. The equipment is all that is to be expected of a car of this size and includes the electric lighting instrument board on which are located the Van Sicklen speedometer, electric generator indicator, oil sight feed gage, ignition and lighting switches and fuse box. Double bulb head lamps are mounted directly on the front frame with the wiring carried through the lamp standards.

Another convenient detail is that the ignition switch is operated by a key in the center of the lighting switch and can be locked in any position. All the electric wiring is carried in conduits. The horn is a Hartford Machine Screw Co. product.

As to the actual performance of the car, factory tests have shown that the engine develops 53 hp. at a speed of 2000 r.p.m., although according to the N. A. C. C. formula it is rated at 29.4 hp. at 1000 feet per minute piston speed. Factory tests have shown a speed of 55 m.p.h. with a high gear low limit of 3 m.p.h. Gasoline mileage is given at 15 to 16 and oil 300 to 400 per gallon.

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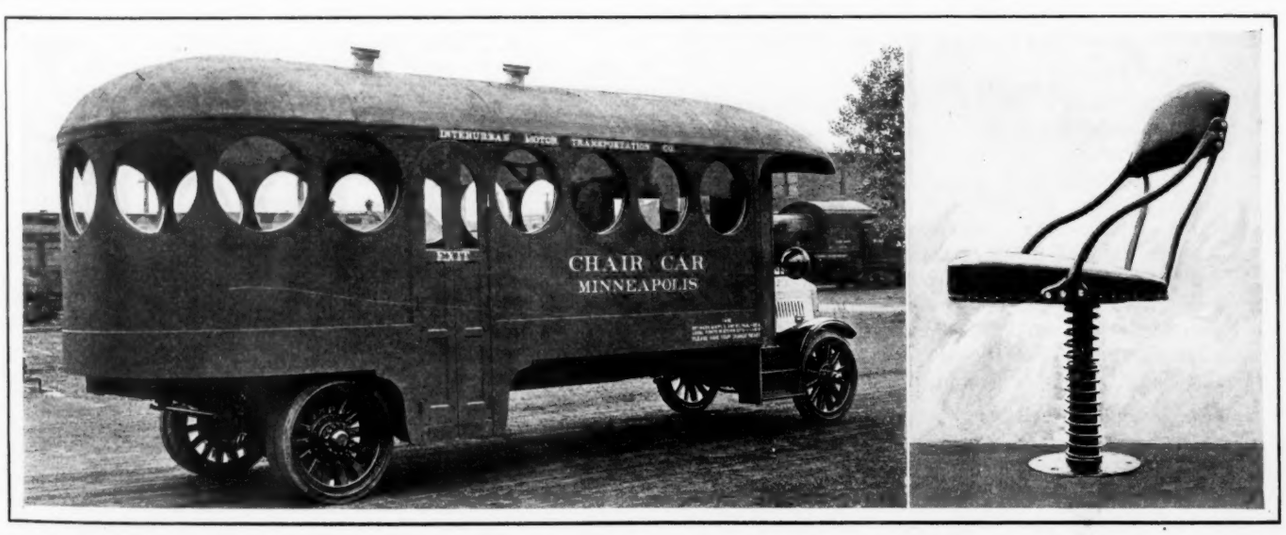
McKeen Highway Coach

The illustration at the bottom of this page shows a type of vehicle put into service some eight months ago. The makers are well-known for their gasoline railroad cars which are similar in appearance, though, of course, somewhat larger than the road automobile car.



Left—McKeen-United Highway Coach. A luxurious chair car on a 3½-ton chassis, intended for interurban transportation. Right—Chair used in Highway Coach. Observe the very long coil spring which supports the weight

Determining Frame Sections

Automobile Frame Section Modulus and Section Characteristics

By A. L. Nelson

THE need of a frame section modulus table for the study of section characteristics is becoming more and more urgent as engineers progress in placing frame design on a rational basis in co-relation with actual road service tests of frames. The purpose of this article is to present a reliable section modulus table covering ⅛, 5/32 and 3/16-in. stock in all sizes of sections likely to be used in pleasure cars; also to call attention to the study of frame section characteristics for comparative analysis. It seems necessary to mention some of the general methods of design, but details of the design are aside from the purpose of this article, so consequently they will not be given.

General Considerations in Design

In designing a frame the bending moments at the most important sections, particularly around the location of the axle center lines where the depth of the sections are decreased for spring clearance, must be determined, and the frame sections designed to resist the corresponding moments. Just what gage of frame stock, depth and width of section is best at each point is a problem well worth considering carefully. A table of section modulus is an important item in aiding the engineer in selecting proper frame section dimensions to resist a given moment for a given stress. (Section modulus equals the bending moment in lb.-in. divided by the allowable stress in lb. per square inch.)

However, a frame section is called upon to withstand a wide range of conditions practically undeterminable in a direct way. To overcome this difficulty a standard of analysis is selected which will give conditions easily analyzed and, at the same time, will be closely proportional to the average actual conditions met in road service. The proportionality factor may then be determined from analysis of frames giving satisfactory service, together with the aid of general engineering experiences. The allowable unit working stress of the frame material is directly related to its physical properties and to the characteristics of the size of sections, thickness of stock used, etc., as will be pointed out later.

Standard Conditions of Analysis

For comparative analysis the loading of the frame may be taken as that resulting from the car with normal passenger load, under static conditions. For instance, such loads as the radiator, motor at supports, transmission, gasoline and tank, body weight at points of support, etc., can be closely approximated and considered as concentrated loads. Furthermore, since the interval of spacing of these loads is somewhat uniformly distributed the miscellaneous loads as fenders, etc., can be distributed with the above principal loads. Having the loading of the frame established, the reactions of the chassis spring and the bending moments at each load may be determined analytically or graphically by standard methods.

Frame-Section Characteristics

As has already been mentioned, the allowable working stress should not be based alone on the physical properties of the material used, but also on the thickness of stock and general characteristics of the sections. Surface defects in ⅛-in. stock bear a larger ratio to the nominal thickness than they do to 5/32 or 3/16-in. stock. Furthermore, the thickness of stock has an important bearing on how much reliance may be placed on the theoretical section modulus. Obviously, for an extra thin stock and a large section the complex stresses set up by simple bending could not even be estimated; hence care must be used in making allowance for complex stresses not accounted for by the methods of computation that are in general use in engineering. It is for such reasons as the above that stresses for ⅛-in. stock used in large sections should be chosen lower than the stresses allowable in heavier stock.

Although the heavier stock makes the more stable section in resisting complex stresses, it does not follow necessarily that it is the most desirable, for the weight per unit length of section may be very great compared with the strength. The thinner stock for the same weight per unit length has its metal placed more effectively to resist bending—that is, the section may be made of more liberal depth and width for the same weight. However, a part of this gain is sacrificed to the lower stresses imposed by the thinner stock. The theoretical gain from using the thinner stock, as for instance ⅛-in., is best studied by graphical comparisons with the heavier stocks, a few of which will now be presented for particular cases.

Effectiveness of Metal Distribution

The effectiveness of metal distribution may be taken as the ratio of the section modulus to the area of the section. Figs. 1 and 2 were constructed for illustrating this property in a comparative way. In Fig. 1, 6-in. depth of section of various widths is compared with 4-in. depth of section, ⅛-in. stock. Curves No. 1 and 2 were plotted by taking values of the section modulus from the frame table for a few widths, and dividing by the corresponding areas of the sections. These ratios were plotted as ordinates and the frame widths as abscissa. Then the smooth curves were drawn through the plotted points. Curve No. 3 gives the results represented in per cent gain in effectiveness of metal distribution of the 6-in. depth of section over the 4-in. for various widths. With widths as used in practice, say above 1½ in. the per cent gain increases with the width of section. The mean gain in this particular camparison is about 38 per cent, a very material increase in effectiveness of metal distribution in favor of the deep sections.

Most of our current frames have comparatively shallow sections, excepting those of some of the cars of recent design. To account for shallow sections, it seems that the designers have been seeking for "looks" rather than actually seeking for the best utilization of metal distribution. Designers trying to use ⅛-in. stock without adopting deeper sections are expecting more than can possibly be realized. As has before been pointed out the ⅛-in. stock should be stressed lower than 5/32 or 3/16-in. stock. This can be done by increasing the section depth of the ⅛-in. stock and still gain in the lightness of construction due to the better distribution of metal. The lower stresses are also advantageous in that the accompanying deflection of the frame is less. The latter necessitates less camber of the frame to take care of the initial deflection;

also lessens body door troubles caused by excessive frame deflections.

Returning to the figures: Fig. 2 is the same as Fig. 1, except variable depths of sections of 1 and 3-in. (⅛-in. stock) were selected. The 3-in. width shows a gain of 26 to 35 per cent over that of 1-in., increasing with the depth of section. Effectiveness of metal distribution is shown by Figs. 1 and 2 to increase both with the depth and with the width of section.

Weight per Unit Length and Strength Comparison

In order to compare the weight per unit length with the strength of section, the section moduli of various sections are plotted as abscissa with their corresponding areas as ordinates. The area is chosen for convenience, since it is proportional to the weight per unit length. Figs. 3 and 4 are given for this comparison.

Fig. 3 is for constant width of sections (2-in.) of ⅛, 5/32 and 3/16-in. stock. The curves were plotted by choosing section moduli at random, then referring these to the section modulus table to obtain the size of the sections and then their corresponding areas were computed. Curve No. 4, Fig. 3, gives the results in per cent increase, 14 and 19, in weight of 5/32-in. stock over that of ⅛-in., while curve No. 5 gives the per cent increase, 26 to 35, for 3/16-in. stock over the ⅛-in.

Fig. 4 is the same as Fig. 5, except for giving variable widths of section with constant depth of 5 in. Here the increase in weight of 5/32-in. stock over the ⅛-in. is from 8 to 12 per cent, and that of the 3/16-in. is from 15 to 24 per cent.

Figs. 3 and 4 tend to show that within reasonable limits of section sizes the lighter gages of stock are the most economical for the same strength of section.

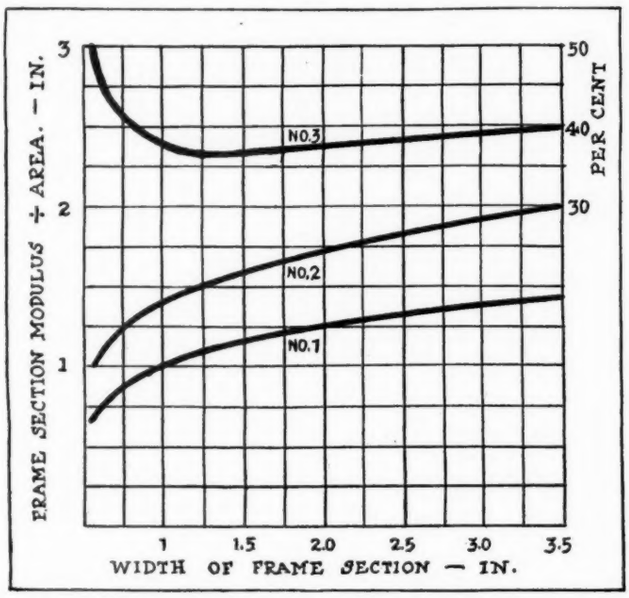
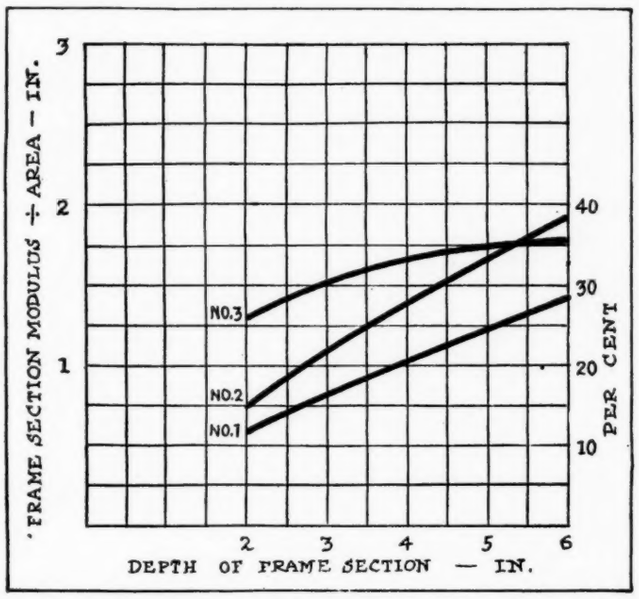


Fig. 1—Effectiveness of metal distribution, 4-in. depth of section compared with 6-in-⅛-in. stock. No. 1, 4-in. depth, No. 2, 6-in. depth, No. 3, % gain 6-in. depth over 4-in.



Fib. 2—Effectiveness of metal distribution, 3-in. width of section compared with 1-in., ⅛-in. stock. No. 1, 1-in. width, No. 2, 3-in. width, No. 3, % gain 3-in. width over 1 in.

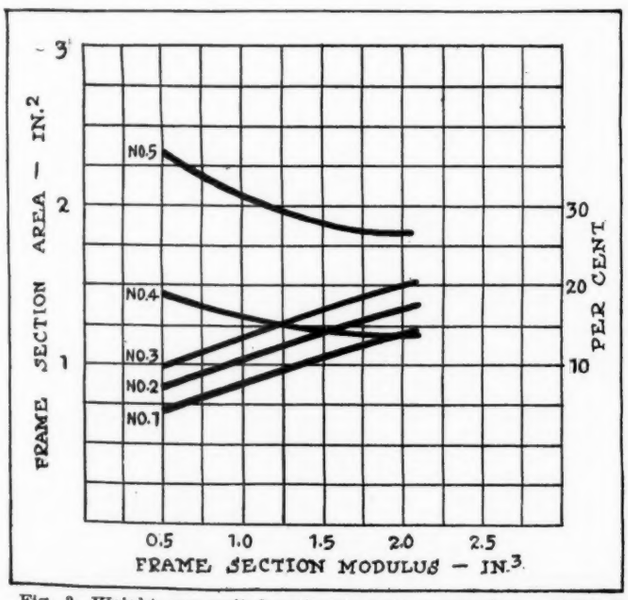


Fig. 3—Weight per unit length—strength comparison. Sections 2-in. wide. No. 1, ⅛-in. stock, No. 2, 5/32-in. stock, No. 3, 3/16-in. stock, No. 4, % increase in weight of 5/32-in. stock over ⅛-in., No. 5, % increase in weight of 3/16-in. stock over ⅛-in.

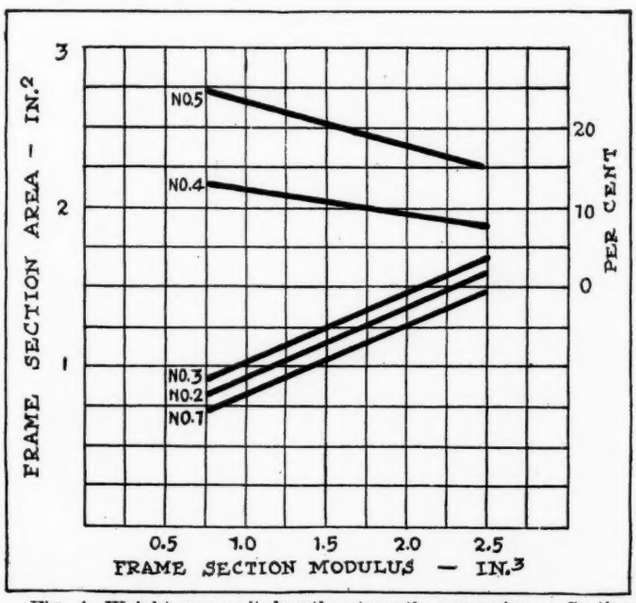


Fig. 4—Weight per unit length—strength comparison. Sections 5-in. deep. No. 1, ⅛-in. stock, No. 2. 5/32-in. stock over ⅛-in., No. 5, % increase in weight of 3/16-in. stock as compared with ⅛-in. stock.

Table of Frame Section Modulus for 1/8 in. Stock

Depth of Section	1	1⅛	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅛	2¼	2⅜	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3⅜	3½
2	.275	.303	.331	.358	.386	.413	.441	.468	.496	.523	.551	.578	.606	.633	.661	.688	.716	.743	.771	.798	.826
2⅛	.300	.330	.359	.389	.418	.447	.477	.506	.536	.565	.595	.624	.654	.683	.712	.742	.771	.801	.830	.860	.889
2¼	.325	.357	.388	.419	.451	.482	.514	.545	.576	.608	.639	.671	.702	.733	.765	.796	.827	.859	.890	.922	.953
2⅜	.351	.384	.418	.451	.484	.518	.551	.584	.618	.651	.684	.718	.751	.784	.818	.851	.884	.918	.951	.984	1.018
2½	.377	.412	.448	.483	.518	.554	.589	.624	.659	.695	.730	.765	.801	.836	.871	.906	.942	.977	1.012	1.048	1.083
2⅝	.404	.441	.479	.516	.553	.590	.628	.665	.702	.739	.776	.814	.851	.888	.925	.963	1000	1.037	1.074	1.112	1.149
2¾	.432	.471	.510	.549	.588	.628	.667	.706	.745	.784	.824	.863	.902	.941	.980	1.019	1.059	1.098	1.137	1.176	1.215
2⅞	.460	.501	.542	.583	.625	.666	.707	.748	.789	.830	.871	.912	.954	.995	1.036	1.077	1.118	1.159	1.200	1.241	1.283
3	.489	.532	.575	.618	.661	.704	.747	.791	.834	.877	.920	.963	1.006	1.049	1.092	1.135	1.178	1.221	1.264	1.307	1.351
3⅛	.519	.564	.609	.654	.699	.744	.789	.834	.879	.924	.969	1.014	1.059	1.104	1.149	1.194	1.239	1.284	1.329	1.374	1.419
3¼	.549	.596	.643	.690	.737	.784	.831	.878	.925	.972	1.019	1.066	1.113	1.159	1.206	1.253	1.300	1.347	1.394	1.441	1.488
3⅜	.580	.629	.678	.726	.775	.824	.873	.922	.971	1.020	1.069	1.118	1.167	1.216	1.265	1.314	1.363	1.411	1.460	1.509	1.558
3½	.611	.662	.713	.764	.815	.866	.917	.967	1.018	1.069	1.120	1.171	1.222	1.273	1.324	1.374	1.425	1.476	1.527	1.578	1.629
3⅝	.643	.696	.749	.802	.855	.908	.960	1.013	1.066	1.119	1.172	1.225	1.277	1.330	1.383	1.436	1.489	1.541	1.594	1.647	1.700
3¾	.676	.731	.786	.841	.895	.950	1.005	1.060	1.115	1.169	1.224	1.279	1.334	1.388	1.443	1.498	1.553	1.607	1.662	1.717	1.772
3⅞	.710	.767	.823	.880	.937	.993	1.050	1.107	1.164	1.220	1.277	1.334	1.391	1.447	1.504	1.561	1.617	1.674	1.731	1.788	1.844
4	.744	.803	.861	.920	.979	1.037	1.096	1.155	1.213	1.272	1.331	1.389	1.448	1.507	1.565	1.624	1.683	1.741	1.800	1.859	1.917
4⅛	.779	.839	.900	.961	1.021	1.082	1.143	1.203	1.264	1.324	1.385	1.446	1.506	1.567	1.628	1.688	1.749	1.809	1.870	1.931	1.991
4¼	.814	.877	.939	1.002	1.065	1.127	1.190	1.252	1.315	1.377	1.440	1.503	1.565	1.628	1.690	1.753	1.815	1.878	1.941	2.003	2.066
4⅜	.850	.915	.979	1.044	1.108	1.173	1.238	1.302	1.367	1.431	1.496	1.560	1.625	1.689	1.754	1.818	1.883	1.947	2.012	2.076	2.141
4½	.887	.954	1.020	1.087	1.153	1.220	1.286	1.352	1.419	1.485	1.552	1.618	1.685	1.751	1.818	1.884	1.951	2.017	2.084	2.150	2.217
4⅝	.925	.993	1.061	1.130	1.198	1.267	1.335	1.404	1.472	1.540	1.609	1.677	1.746	1.814	1.883	1.951	2.019	2.088	2.156	2.225	2.293
4¾	.963	1.033	1.103	1.174	1.244	1.315	1.385	1.455	1.526	1.596	1.666	1.737	1.807	1.878	1.948	2.018	2.089	2.159	2.230	2.300	2.370
4⅞	1.001	1.074	1.146	1.218	1.291	1.363	1.435	1.508	1.580	1.652	1.725	1.797	1.869	1.942	2.014	2.086	2.159	2.231	2.303	2.376	2.448
5	1.041	1.115	1.189	1.264	1.338	1.412	1.486	1.561	1.635	1.709	1.784	1.858	1.932	2.006	2.081	2.155	2.229	2.304	2.378	2.452	2.526
5⅛	1.081	1.157	1.233	1.309	1.386	1.462	1.538	1.614	1.691	1.767	1.843	1.919	1.996	2.072	2.148	2.224	2.301	2.377	2.453	2.529	2.605
5¼	1.121	1.200	1.278	1.356	1.434	1.512	1.591	1.669	1.747	1.825	1.903	1.982	2.060	2.138	2.216	2.294	2.372	3.451	2.529	2.607	2.685
5⅜	1.163	1.243	1.323	1.403	1.483	1.563	1.644	1.724	1.804	1.884	1.964	2.044	2.124	2.205	2.285	2.365	2.445	2.525	2.605	2.685	2.766
5½	1.205	1.287	1.369	1.451	1.533	1.615	1.697	1.779	1.862	1.944	2.026	2.108	2.190	2.272	2.354	2.436	2.518	2.600	2.682	2.764	2.846
5⅝	1.247	1.331	1.415	1.500	1.584	1.668	1.752	1.836	1.920	2.004	2.088	2.172	2.256	2.340	2.424	2.508	2.592	2.676	2.760	2.844	2.928
5¾	1.291	1.377	1.463	1.549	1.635	1.721	1.807	1.893	1.979	2.065	2.151	2.237	2.323	2.409	2.495	2.581	2.667	2.753	2.839	2.925	3.011
5⅞	1.335	1.423	1.511	1.598	1.686	1.774	1.862	1.950	2.038	2.126	2.214	2.302	2.390	2.478	2.566	2.654	2.742	2.830	2.918	3.006	3.094
6	1.379	1.469	1.559	1.649	1.739	1.829	1.919	2.009	2.098	2.188	2.278	2.368	2.458	2.548	2.638	2.728	2.818	2.907	2.997	3.087	3.177

Table of Frame Section Modulus for 5/32 in. Stock

Depth of Section																					
2	.329	.362	.395	.429	.462	.495	.528	.562	.595	.628	.662	.695	.728	.761	.795	.828	.861	.894	.928	.961	.994
2⅛	.359	.394	.430	.466	.501	.537	.573	.608	.644	.680	.716	.751	.787	.823	.858	.894	.930	.965	1.001	1.037	1.073
2¼	.389	.427	.465	.504	.542	.580	.618	.656	.694	.732	.770	.809	.847	.885	.923	.961	.999	1.037	1.075	1.114	1.152
2⅜	.421	.461	.502	.542	.583	.623	.664	.704	.745	.785	.826	.867	.907	.948	.988	1.029	1.069	1.110	1.150	1.191	1.232
2½	.453	.496	.539	.582	.625	.668	.711	.754	.797	.840	.883	.926	.969	1.012	1.054	1.097	1.140	1.183	1.226	1.269	1.312
2⅝	.486	.531	.577	.622	.668	.713	.758	.804	.849	.895	.940	.985	1.031	1.076	1.122	1.167	1.212	1.258	1.303	1.349	1.394
2¾	.520	.568	.615	.663	.711	.759	.807	.855	.903	.950	.998	1.046	1.094	1.142	1.190	1.237	1.285	1.333	1.381	1.429	1.477
2⅞	.555	.605	.655	.705	.756	.806	.856	.906	.957	1.007	1.057	1.107	1.158	1.208	1.258	1.309	1.359	1.409	1.459	1.510	1.560
3	.590	.643	.695	.748	.801	.854	.906	.959	1.012	1.064	1.117	1.170	1.222	1.275	1.328	1.381	1.433	1.486	1.539	1.591	1.644
3⅛	.626	.682	.737	.792	.847	.902	.957	1.012	1.068	1.123	1.178	1.233	1.288	1.343	1.398	1.454	1.509	1.564	1.619	1.674	1.729
3¼	.664	.721	.779	.836	.894	.951	1.009	1.067	1.124	1.182	1.239	1.297	1.354	1.412	1.470	1.527	1.585	1.642	1.700	1.757	1.815
3⅜	.702	.762	.822	.882	.942	1.002	1.062	1.122	1.182	1.242	1.302	1.362	1.422	1.482	1.542	1.602	1.662	1.722	1.782	1.842	1.902
3½	.740	.803	.865	.928	.990	1.053	1.115	1.177	1.240	1.302	1.365	1.427	1.490	1.552	1.615	1 677	1.739	1.802	1.864	1.927	1.989
3⅝	.780	.845	.910	.975	1.040	1.104	1.169	1.234	1.299	1.364	1.429	1.494	1.558	1.623	1.688	1.753	1.818	1.883	1.948	2.013	2.077
3¾	.820	.888	.955	1.022	1.090	1.157	1.224	1.292	1.359	1.426	1.494	1.561	1.628	1.696	1.763	1.830	1.897	1.965	2.032	2.099	2.167
3⅞	.862	.931	1.001	1.071	1.141	1.210	1.280	1.350	1.420	1.489	1.559	1.629	1.699	1.768	1.838	1.908	1.978	2.047	2.117	2.187	2.257
4	.904	.976	1.048	1.120	1.193	1.265	1.337	1.409	1.481	1.553	1.626	1.698	1.770	1.842	1.914	1.987	2.059	2.131	2.203	2.275	2.347
4⅛	.947	1.021	1.096	1.171	1.245	1.320	1.394	1.469	1.544	1.618	1.693	1.768	1.842	1.917	1.991	2.066	2.141	2.215	2.290	2.364	2.439
4¼	.990	1.067	1.144	1.222	1.299	1.376	1.453	1.530	1.607	1.684	1.761	1.838	1.915	1.992	2.069	2.146	2.223	2.300	2.377	2.454	2.531
4⅜	1.035	1.114	1 194	1.273	1.353	1.432	1.512	1.591	1.671	1.750	1.830	1.909	1.989	2.068	2.148	2.227	2.307	2.386	2.466	2.545	2.625
4½	1.080	1.162	1.244	1 326	1.408	1.490	1.572	1.654	1.736	1.818	1.900	1.982	2.063	2.145	2.227	2.309	2.391	2.473	2.555	2.637	2.719
4⅝	1.126	1.211	1.295	1.380	1.464	1.548	1.633	1.717	1.801	1.886	1.970	2.054	2.139	2.223	2 308	2.392	2.476	2.561	2.645	2.729	2.814
4¾	1.173	1.260	1.347	1.434	1.521	1.607	1.694	1.781	1.868	1.955	2.041	2.128	2.215	2.302	2.389	2.475	2.562	2.649	2.736	2.823	2.909
4⅞	1.221	1.310	1.400	1.489	1.578	1.667	1.757	1.846	1.935	2.024	2.114	2.203	2.292	2.381	2 471	2.560	2.649	2.738	2.828	2 917	3.006
5	1.270	1.362	1.453	1.545	1.637	1.728	1.820	1.912	2.003	2.095	2.187	2.278	2.370	2.462	2.553	2.645	2.737	2.828	2 920	3.012	3.103
5⅛	1.319	1.413	1.507	1.602	1.696	1.790	1.884	1.978	2 072	2.166	2.260	2.355	2.449	2.543	2.637	2.731	2.825	2.919	3.013	3.108	3.202
5¼	1.369	1.466	1.563	1.659	1.756	1.852	1.949	2.045	2.142	2.239	2.335	2.432	2.528	2.625	2.721	2.818	2.914	3.011	3.108	3.204	3.301
5⅜	1.420	1.520	1.619	1.718	1.817	1.916	2.015	2.114	2.213	2.312	2.411	2.510	2.609	2.708	2.807	2.906	3.005	3.104	3.203	3.302	3.401
5½	1.472	1.574	1.675	1.777	1.878	1.980	2.081	2.182	2.284	2.385	2.487	2.588	2.690	2.791	2.892	2.994	3.095	3.197	3.298	3.400	3.501
5⅝	1.525	1.629	1.733	1.837	1.941	2.044	2.148	2.252	2.356	2.460	2.564	2.668	2.771	2.875	2.979	3.083	3.187	3.291	3.395	3.499	3.602
5¾	1 579	1.685	1.791	1.897	2.004	2.110	2.216	2.323	2.429	2.535	2.642	2.748	2.854	2.961	3.067	3.173	3.280	3.386	3.492	3.598	3.705
5⅞	1.633	1.742	1.850	1.959	2.068	2.177	2.285	2.394	2.503	2.612	2.720	2.829	2.938	3.047	3.155	3.264	3.373	3 482	3.590	3.699	3.808
6	1.688	1.799	1.910	2.022	2.133	2.244	2.355	2.466	2 577	2.68	2.800	2.911	3.022	3.133	3.245	3.356	3.467	3.578	3.689	3.801	3.912

Table of Frame Section Modulus for 3/16 in. Stock

Depth of Section																					
2	.376	.415	.453	.492	.531	.569	.608	.646	.685	.724	.762	.801	.840	.878	.917	.956	.994	1.033	1.071	1.110	1.149
2⅛	.411	.453	.494	.536	.577	.619	.660	.702	.743	.785	.826	.868	.909	.951	.992	1.034	1.075	1.117	1.159	1.200	1.242
2¼	.447	.491	.536	.580	.625	.669	.714	.758	.802	.847	.891	.936	.980	1.025	1.069	1.113	1.158	1.202	1.247	1.291	1.336
2⅜	.484	.531	.579	.626	.673	.721	.768	.815	.863	.910	.957	1.005	1.052	1.099	1.147	1.194	1.241	1.289	1.336	1.383	1.431
2½	.522	.572	.622	.673	.723	.773	.823	.874	.924	.974	1.024	1.074	1.125	1.175	1.225	1.275	1.326	1.376	1.426	1.476	1.527
2⅝	.561	.614	.667	.720	.773	.827	.880	.933	.986	1.039	1.092	1.145	1.199	1.252	1.305	1.358	1.411	1.464	1.517	1.571	1.624
2¾	.601	.657	.713	.769	.825	.881	.937	.993	1.049	1.105	1.161	1.217	1.273	1.329	1.385	1.442	1.498	1.554	1.610	1.666	1.722
2⅞	.642	.701	.760	.818	.877	.936	.995	1.054	1.113	1.172	1.231	1.290	1.349	1.408	1.467	1.526	1.585	1.644	1.703	1.762	1.821
3	.683	.745	.807	.869	.931	.993	1.055	1.117	1.179	1.240	1.302	1.364	1.426	1.488	1.550	1.612	1.674	1.736	1.797	1.859	1.921
3⅛	.726	.791	.856	.921	.986	1.050	1.115	1.180	1.245	1.310	1.374	1.439	1.504	1.569	1.634	1.698	1.763	1.828	1.893	1.958	2.022
3¼	.770	.838	.906	.973	1.041	1.109	1.177	1.244	1.312	1.380	1.447	1.515	1.583	1.651	1.718	1.786	1.854	1.921	1.989	2.057	2.125
3⅜	.815	.886	.956	1.027	1.098	1.168	1.239	1.310	1.380	1.451	1.521	1.592	1.663	1.733	1.804	1.875	1.945	2.016	2.087	2.157	2.228
3½	.861	.934	1.008	1.081	1.155	1.229	1.302	1.376	1.449	1.523	1.596	1.670	1.743	1.817	1.891	1.964	2.038	2.111	2.185	2.258	2.332
3⅝	.908	.984	1.061	1.137	1.214	1.290	1.366	1.443	1.519	1.596	1.672	1.749	1.825	1.902	1.978	2.055	2.131	2.208	2.284	2.361	2.437
3¾	.955	1.035	1.114	1.194	1.273	1.352	1.432	1.511	1.591	1.670	1.749	1.829	1.908	1.988	2.067	2.146	2.226	2.305	2.384	2.464	2.543
3⅞	1.004	1.087	1.169	1.251	1.333	1.416	1.498	1.580	1.663	1.745	1.827	1.910	1.992	2.074	2.157	2.239	2.321	2.403	2.486	2.568	2.650
4	1.054	1.139	1.224	1.310	1.395	1.480	1.565	1.651	1.736	1.821	1.906	1.991	2.077	2.162	2.247	2.332	2.418	2.503	2.588	2.673	2.759
4⅛	1.105	1.193	1.281	1.369	1.457	1.545	1.634	1.722	1.810	1.898	1.986	2.074	2.163	2.251	2.339	2.427	2.515	2.603	2.692	2.780	2.868
4¼	1.156	1.247	1.339	1.430	1.521	1.612	1.703	1.794	1.885	1.976	2.067	2.158	2.249	2.340	2.432	2.523	2.614	2.705	2.796	2.887	2.978
4⅜	1.209	1.303	1.397	1.491	1.585	1.679	1.773	1.867	1.961	2.055	2.149	2.243	2.337	2.431	2.525	2.619	2.713	2.807	2.901	2.995	3.089
4½	1.263	1.360	1.457	1.554	1.650	1.747	1.844	1.941	2.038	2.135	2.232	2.329	2.426	2.523	2.620	2.717	2.813	2.910	3.007	3.104	3.201
4⅝	1.317	1.417	1.517	1.617	1.717	1.817	1.916	2.016	2.116	2.216	2.316	2.416	2.516	2.615	2.715	2.815	2.915	3.015	3.115	3.214	3.314
4¾	1.373	1.476	1.579	1.681	1.784	1.887	1.990	2.092	2.195	2.298	2.401	2.503	2.606	2.709	2.812	2.915	3.017	3.120	3.223	3.326	3.428
4⅞	1.430	1.535	1.641	1.747	1.852	1.958	2.064	2.170	2.275	2.381	2.487	2.592	2.698	2.804	2.909	3.015	3.121	3.227	3.332	3.438	3.544
5	1.487	1.596	1.704	1.813	1.922	2.030	2.139	2.247	2.356	2.465	2.573	2.682	2.791	2.899	3.008	3.116	3.225	3.334	3.442	3.551	3.659
5⅛	1.546	1.657	1.769	1.880	1.992	2.103	2.215	2.327	2.438	2.550	2.661	2.773	2.884	2.996	3.107	3.219	3.330	3.442	3.553	3.665	3.777
5¼	1.605	1.720	1.834	1.949	2.063	2.178	2.292	2.407	2.521	2.636	2.750	2.864	2.979	3.093	3.208	3.322	3.437	3.551	3.666	3.780	3.895
5⅜	1.666	1.783	1.901	2.018	2.135	2.253	2.370	2.488	2.605	2.722	2.840	2.957	3.075	3.192	3.309	3.427	3.544	3.661	3.779	3.896	4.014
5½	1.727	1.848	1.968	2.088	2.209	2.329	2.449	2.569	2.690	2.810	2.930	3.051	3.171	3.291	3.412	3.532	3.652	3.773	3.893	4.013	4.134
5⅝	1.790	1.913	2.036	2.159	2.283	2.406	2.529	2.652	2.776	2.899	3.022	3.145	3.269	3.392	3.515	3.638	3.762	3.885	4.008	4.131	4.255
5¾	1.853	1.979	2.106	2.232	2.358	2.484	2.610	2.736	2.863	2.989	3.115	3.241	3.367	3.493	3.620	3.746	3.872	3.998	4.124	4.250	4.377
5⅞	1.918	2.047	2.176	2.305	2.434	2.563	2.692	2.821	2.950	3.079	3.209	3.338	3.467	3.596	3.725	3.854	3.983	4.112	4.241	4.370	4.499
6	1.983	2.115	2.247	2.379	2.511	2.643	2.775	2.907	3.039	3.171	3.303	3.435	3.567	3.699	3.831	3.963	4.095	4.227	4.359	4.491	4.623

Width of Section

Detroit S. A. E. Holds Big Meeting

K. W. Zimmerschied Receives Presentation—Short Discussion Follows Paper on Trend of Automobile Design

DETROIT, Feb. 16—In the paper read here to-night before the Detroit Section of the Society of Automobile Engineers on the "Trend and Possibilities of Automobile Design" by A. Ludlow Clayden and L. V. Spencer, editorial department Class Journal Co., the large audience was particularly impressed with the plea made for the development of engines which would efficiently use cheaper and heavier fuel. This was suggested as the logical means of combating the advancing cost of gasoline. Extracts from the paper were published in the Feb. 17 issue of THE AUTOMOBILE.

Before the presentation of the paper by Mr. Clayden, Russell Huff, President of the Society, made an address in praise of the work of K. W. Zimmerschied, metallurgist of the General Motors Co., who resigned as chairman of the Standards Committee of the Society, owing to the press of other work. In token of appreciation of his work a framed copy of a resolution of thanks, which was passed by the council, was presented to Mr. Zimmerschied, and on behalf of the members of the Council and of the Standards Committee he was given a leather desk set as a further mark of their high regard for his work and for himself.

Large Attendance

The attendance was perhaps the largest yet enjoyed by the Detroit Section, and several of the automobile centers near Detroit were represented by good-sized delegations. Fifty student members of the Michigan University Section of the Society also came in from Ann Arbor for the occasion.

Discussion Short but Animated

A. P. Brush, Brush Engineering Association, stated that he believed Mr. Clayden had come to an erroneous conclusion when he said:

"I must preface my remarks in connection with certain points in Mr. Clayden's paper, from which I differ, by expressing a profound admiration for the able manner in which Mr. Clayden has handled an exceedingly difficult subject, an admiration which I am confident I share with everyone present this evening.

"Mr. Clayden makes some remarks regarding the future of heavy oil engines for automobile service, and concludes his remarks in this connection with this statement: 'But it has got to be done somehow, the thing has got to be faced and the sooner it is faced squarely the sooner it will be over.'

"Mr. Clayden's reason for this conclusion is expressed in a previous paragraph in this language: 'A practically inexhaustible supply of fuel from which to draw.'

"I believe Mr. Clayden has come to an erroneous conclusion, because he considered only one of the two obvious solutions; that is, the origination of a new type of engine capable of using satisfactorily less volatile hydrocarbon fuels with equal satisfaction to the operator.

Expects Chemical Solution

"It is a well-known fact that the less volatile hydrocarbons are made up of the same two elements, hydrogen and carbon, but with an excess of carbon, and if, or when progress in synthetic chemistry enables us to add the necessary hydrogen and secure a molecular reconstruction, a greater amount of more volatile fuel will be secured than the original amount of the less volatile crude product.

"Mr. Clayden refers briefly to a somewhat unusual use of the conventional leaf spring for car suspension. Being somewhat familiar with this construction, I ask your indulgence for the purpose of amplifying Mr. Clayden's remarks somewhat and correcting an erroneous impression which some engineers and laymen have formed regarding it.

"Because the construction referred to is a compounding of two semi-elliptic springs arranged transversely to the axis of the car, the two springs being attached to each other at the center, it is commonly assumed that, owing to this center attachment, this suspension will not resist the tendency of the car body to roll from the effect of centrifugal force on turning a corner, as much as the more common arrangements of springs arranged longitudinally at the sides of the car.

"A mathematical and geometrical consideration of this suspension will readily show what the most exhaustive tests have demonstrated in practice, that it is better adapted to resist this rolling tendency than any of the other leaf spring arrangements now in use. I might also add that any riding characteristics achievable with any of the other known types of leaf spring arrangements can be at least duplicated and with a lesser amount of spring steel and a much better loading of the rear axle structure.

Detachable Cylinder Head Best in One Piece

"Mr. Clayden calls attention to the advantages of the detachable cylinder head, but comes to some conclusions regarding it, which in my judgment are not sound, in that these conclusions seem to be based upon an over-valuation of certain hypothetical advantages.

"For example: it does not seem to me sound logic to overemphasize the need of extreme rapidity in removing and replacing a detachable cylinder head.

"There are normally only two reasons for removing the cylinder head in service. They are carbon deposits and deterioration of the exhaust valves. Primarily the use of a properly controlled oiling system instead of the horribly unscientific compromise systems which are still too common, and, secondarily, a little care to avoid running the engine with too rich a mixture would eliminate the need of cleaning carbon oftener than once per year of average service.

"Exhaust valve deterioration decreases rapidly and the power output per cubic inch of piston displacement increases rapidly with a proportionate decrease in cylinder and valve sizes.

"If, therefore, as I am confident, cylinder head removals can be reduced to an average of not more than one per season, I fail to see how the saving of *all* of the time necessary to remove a bolted-on head can be any large advantage to the user.

"I must also take exception to the conclusion of Mr. Clayden expressed in the following quotation on page 11: 'In nearly every case half the advantage is thrown away by making the detachable head in one piece.' Where the detachable head carries with it the valves, thus permitting valve grinding at the bench instead of in the car, I believe the one-piece head is a distinct advantage, inasmuch as all cylinders and all exhaust valves will need attention, in a well-designed and constructed engine, at least approximately at the same time, and this construction permits a quick interchange of

heads, giving the user the maximum of service in the minimum of time and allowing the garage mechanic to do his valve grinding between times.

"Mr. Clayden calls attention to the inherent accessibility advantage in the adjustable fulcrum overhead valve mechanism, but goes on to say: 'There are many pros and cons for the valve-in-the-head construction.' In this matter I am frankly a partisan, so much so, in fact, that I am quite incapable of appreciating the 'cons' of the overhead construction of the type referred to.

"Of course, I realize that the older types of rocker actuated overhead valves have been so badly carried out that the kinetic energy of the reciprocating valve parts was so high as to seriously interfere with the quietness and flexibility of the engine. Not only that, but the failure to understand the possibilities of proper rocker construction has prevented the securing of other important advantages in the whole valve mechanism.

"Considering the adjustable fulcrum, multiplying rocker valve train in which the multiplication ratio of the rocker is two to one, several things are apparent.

"First, the cam form is such that the flat surface cam rider or tappet may be used with safety. Second, the adjustment of valve train backlash disappears from the moving parts, permitting the use of the thimble type of cam rider or tappet in its best and lightest form. Third, the kinetic energy of the cam rider or tappet and the push rod is only one-quarter what it would be without the use of a multiplying rocker. Fourth, the weight of the reciprocating parts is lower than it could be without the use of the adjustable fulcrum for the rocker.

"These four characteristics are the prime reasons for the quietness and durability of this type of mechanism, particularly at high speeds. It is a fact that the flat-ended cam rider or tappet with a proper co-acting cam has characteristics which make it inherently better adapted for high speed work than the more expensive and heavier roller type of tappet, but for reasons clearly apparent in the second diagram, the flat-ended cam rider calls for a cam form which does not work out advantageously without the use of the multiplying rocker or its equivalent.

"I believe that the overhead valve engine, if properly designed and constructed, is from every standpoint the superior of any other type of poppet valve engine, especially in the hands of the average automobile user. So naturally, I cannot agree with Mr. Clayden that 'There are many pros and cons for the valve-in-the-head construction.'"

McCulla Likes Seat Back Straight

W. R. McCulla, engineer of the Packard company, in commenting upon the criticisms in the paper of the straight backs to the seats in the average car, he said that he had noticed a great many high speed cars recently, both in France and England, and in the majority of cases where they have some form of sway-back seat, such as is advocated in the paper, the driver always had a cushion behind him. Europeans have quite universally known and adopted the low-seated car, said

(*Concluded on page* 379)

New Headlight Mountings Are Rigid

Conditions of Heavy Lamp and Sightly Support Met by Scientific Distribution of Material—Vibration Must Be Dampened by Bracket System

CASUALLY it would not seem that the mounting of the headlamps had a marked effect on the satisfactory condition of the car, and yet if the work is done improperly the headlamps can be the first parts of the car to cause trouble and to indicate that the vehicle has passed its first stage of youth. In mounting the headlights it is necessary for the sake of harmonious appearance of the car that heavy and unsightly brackets do not protrude themselves to such an extent that they catch the eye as something apart from the general lines of the car. At the same time the lamps which are of considerable weight must be rigidly supported.

Bad Effects of Vibration

These two opposing conditions, the heavy lamp and the slender support, give rise to the damaging vibration which oftentimes causes a rupture of the lamp support and necessitates a patchwork job to again restore the lamp to its normal position. When the car passes over the road, striking all sorts of obstructions, vibration is set up which is transmitted particularly to rigid bars in the form of a pillar supported at one end and free at the other. It is in this condition that maximum vibration effects are obtained, and when the lamp is mounted on such a pillar, the full effect of its weight is felt and the supporting structure is soon broken down unless it is so rigid that it is unaffected by the shocks imparted to it.

It is not uncommon, where the lamp has been supported by a bracket bolted directly to the flange of the channel bar frame side member, to see the entire part of the flange of the channel beam broken away due to fatigue brought on by the continued stresses set up by vibration of the lamp support carrying its relatively heavy load.

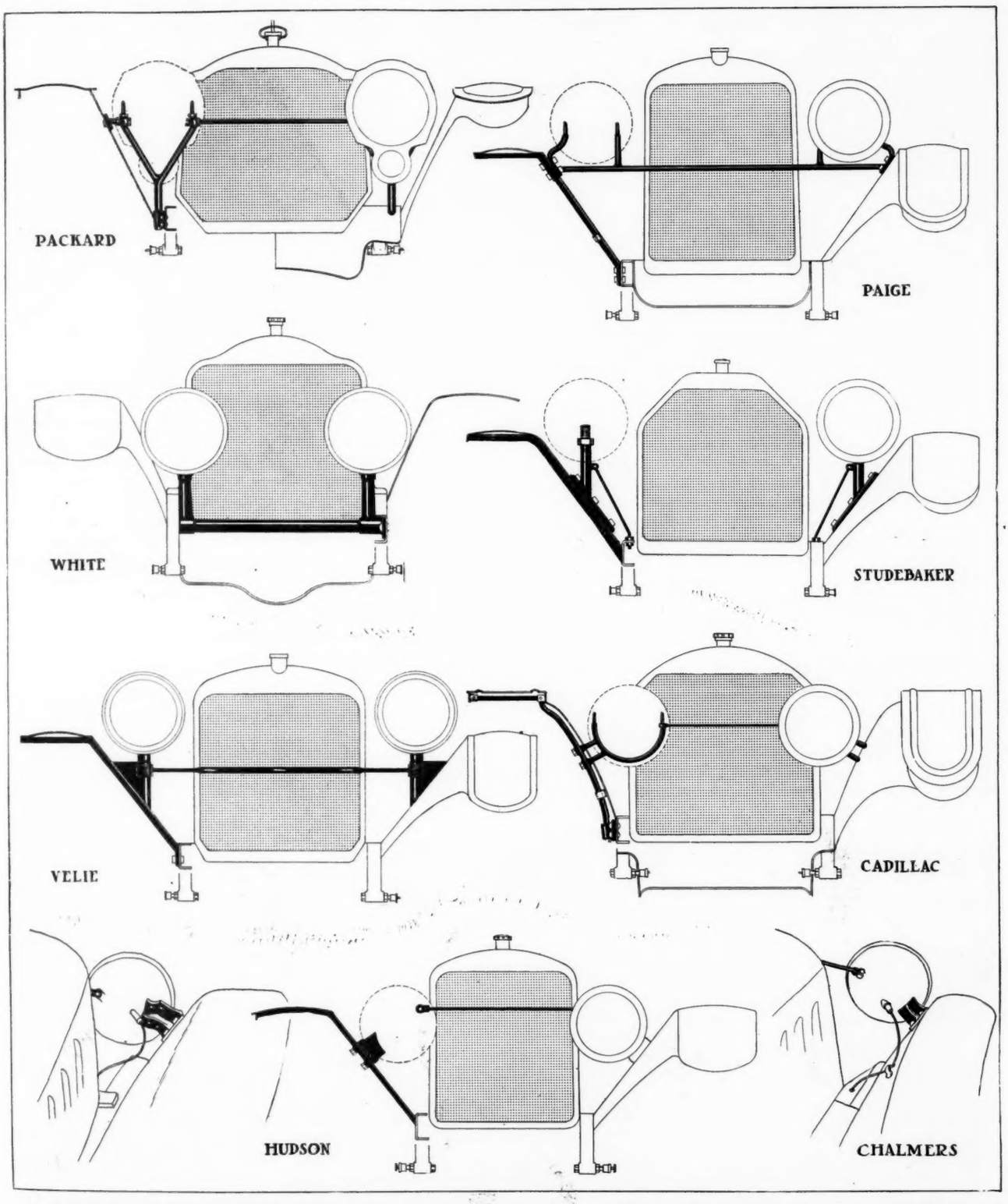
There are two ways in which the stresses can be met and an analysis of the sketches shown on the opposite page brings these to light very clearly. First: The vibrations can be described by eliminating the pillar effect by a cross bar between the two supports. The vibration will then be destroyed, because it would be impossible on account of the differences in synchronism between the two pillars which offset the vibrations by means of the cross support. The second method is by making the lamp supports so rigid that the vibrations are not capable of fatiguing the material.

Examples of where the cross bar method is used are shown in the Packard, Paige, Velie, Cadillac and Hudson cars, while the stiff structure which in itself is capable of resisting vibration is shown in the White and Studebaker. In the White care a stiff tubular structure gives rigidity and at the same time, although there is no cross bar between the lamps, there is a cross connection at the bottoms of the lamp pillars.

High Mounting Favored

There are some very interesting installations also, that are not shown in the accompanying group, although these are quite typical and are indicative of the basic methods of rigid bracing with a minimum amount of metal. It will be noted in passing that there is quite a tendency to keep the lamps high to give a good spread for the cone of light, and there is very little tendency to tilt the lamp downward in order to bring the rays below the eye level of pedestrians. The tilted lamp is at best a makeshift and not a scientific method of meeting the glare problem. It is not surprising, therefore, that it has not found favor and the dimming bulb still retains its popularity with the main lamp designed to cast a beam far in advance of the car.

Headlight Bracketing on Typical Cars



As shown in the above illustrations, there are two systems of headlight mounting, one in which a cross bar is used, which not only breakes the synchronism of vibration of the two headlight pillars, but also acts as a transverse stiffener and the rigid pillar support in which sufficient metal is used and so disposed as to give perpendicular rigidity without cross bracing. Packard, Paige, Velie, Cadillac and Hudson are good examples of different systems of cross bracing, some of the transverse bars being attached to the lamps themselves and others to the supports. Typical supports which are rigid enough in themselves not to require a transverse bar are shown by the illustrations of the White and Studebaker.

Thomas Aero Motor Compact and Powerful

New Small-Bore, High-Speed Eight-Cylinder V-Type Develops 135 hp.—Crankshaft Speed 2000 r.p.m.—Valve Caps Water-Cooled—Aluminum Intake Manifold

SMALL-BORE high-speed motors are going to be the ultimate power plants in aviation work as well as in automobile practice, according to the views of the Thomas Aeromotor Co., Inc., Ithaca, N. Y., which has recently brought out a new eight-cylinder V-motor of this description. According to the claims of the manufacturer, it will develop 135 hp. and yet its dimensions are but 36 in. in length between front and rear gear cover plates and 28 in. in maximum width. The crankshaft speed is 2000 r.p.m. and the propeller shaft operates through spur reduction gears at 1200 r.p.m.

Aeronautical and automobile practice are paralleling each other in simple and accessible grouping of accessories, and in this respect the Thomas motor is thoroughly up to date. In general appearance the new motor is not unlike the conventional eight-cylinder 90-deg. automobile motor. The cylinders are L-head design, 4-in. bore, 5-in. stroke with 1⅛-in. valves of tungsten steel. A feature in the cylinder design which stamps the motor as different from automobile practice is the water-cooling of the valve caps, access to them being by the removal of aluminum cover plates.

The valve springs are of large diameter and of fairly heavy section to prevent floating of the valve at top speeds. Other details of the cylinder design which are worthy of attention are the generous proportions of the cylinder feet and the closeness of the studs to the cylinder bores. The method of holding the push rod guides in an extension of the cylinder feet is also interesting.

High Volumetric Efficiency

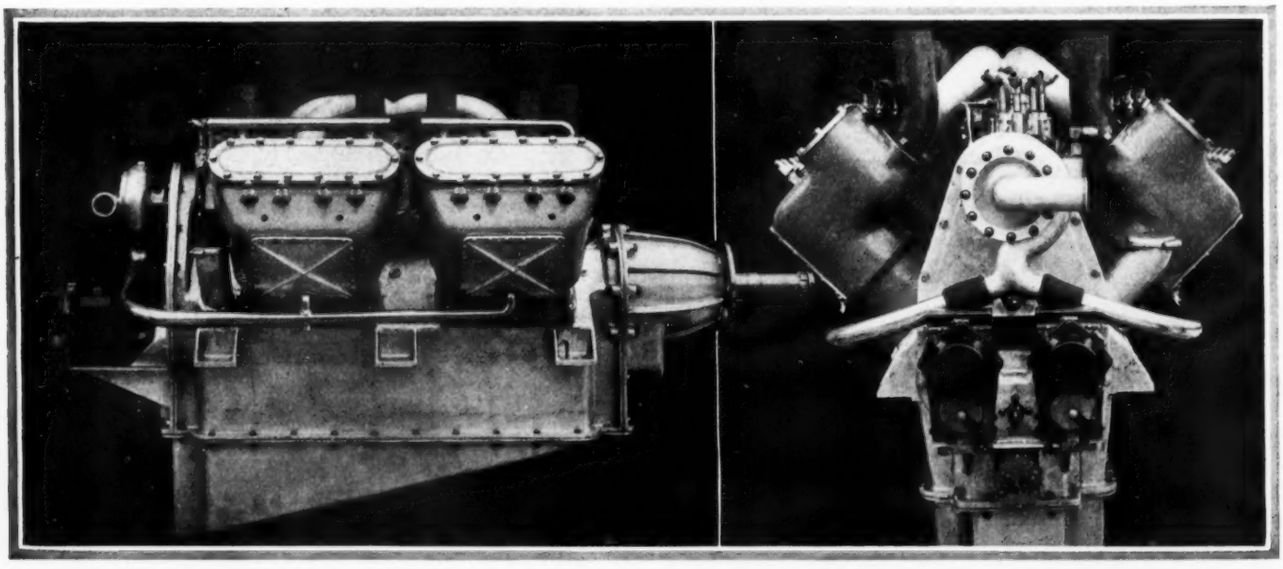
In working out the design of the valves and manifolds particular attention has been given to secure accurate action and high volumetric efficiency. The push rods are of square section and work in broached aluminum guides. They are acted upon directly by the cams without intermediate rockers or followers and are drilled hollow to secure light weight.

An aluminum intake manifold is used which is fitted to a 2-in. double-barrel Zenith carbureter. One nozzle and jet takes care of one block of cylinders and efforts have been made to eliminate bends in the gas passages. The result of this installation is shown in the economy which is claimed to be a consumption of but 13½ gal. per hour. One water pump is used with a siamese outlet to the cylinder jackets. The starter is located in the V with its shaft extending through the gear housing and carrying on its outer end the centrifugal water pump rotor. Two Dixie magnetos are run at crankshaft speed, with four plugs per cylinder.

Force-Feed Lubrication

Oiling is by force feed with the lubricant delivered at 60-lb. pressure. Crankpins, webs and main journals are drilled so as to carry oil to the lower connecting-rod bearings which are side by side arrangements. The pistons, which are of a special aluminum alloy, are lubricated by oil thrown from the crankpins and in order to maintain the oil temperature within the proper limits there is an oil cooling system with a circulating gear pump entirely independent of the lubricating system. The oil in the sump is taken by this separate gear pump and passed through cooling coils exposed to the air stream from the propeller and this again delivered to the sump. Means are provided for shutting off this oil-cooling system in cold weather.

As would be expected in aeronautical use, light-weight reciprocating parts are a necessity. The connecting-rods are of H-section made of chrome-nickel steel machined on all sides. They are 11⅜ in. between centers and the webs and flanges are but 5/64 in. in thickness. A complete assembly of piston, piston pin, connecting-rod and connecting-rod cap weighs but 3¾ lb. The babbitt is applied directly to the steel at the lower end of the connecting-rod. The crankshaft is supported on three bearings.



Two views of the new Thomas eight-cylinder aeroplane motor. The valve caps are water-cooled, being rendered accessible by the removal of the aluminum cover plates

The FORVM

THE AUTOMOBILE'S SUGGESTED IDEAL BODY PROPORTIONS MEET WITH GENERAL APPROBATION—FURTHER CONSIDERATION OF THE TRACTOR PROBLEM

Public Must Be Considered in Body Design

By R. W. Strickland

Chief Engineer Peerless Motor Car Co.

IN regard to Mr. Schipper's article in THE AUTOMOBILE for Feb. 3, such publicity is excellent, but may be misleading unless all the factors in the case have been considered.

For instance, the doorway from which the measurements are taken is not the regular entrance door and is suitable only as an emergency entrance and exit. Of course, the greater distance allowed there the better for the driver, who occasionally gets out in the middle of the street and not on the sidewalk.

In our design we gave what we considered sufficient clearance for entrance and exit without deforming the side of the body and relative proportion of the front and rear doorways, and also without making the right-hand door and front pillar different from the left-hand side. If the left-hand door is widened to give the extreme clearance called for it will be out of proportion with the possibilities of the rear door width unless the front pillar is retired. This is impossible on the right-hand side, as the distance between the front of seat cushion and the front pillar has to be kept at a fixed minimum to facilitate normal entrance.

In regard to the position of the levers, the point of reaching for the levers has been exaggerated. Also the position of the driver which you assume, as most real drivers prefer an upright position to the reclining one. Furthermore, in retarding the change speed and brake levers when located in the center of the car for right-hand control with left-hand drive, the further they are retired the less foot room is left for the driver getting into the seat from the curb side.

Bent Levers Undesirable

A comparison, of course, may be suggested in the way of bent levers, but such things nowadays are being avoided from a manufacturing and service standpoint and I have no doubt that most of the manufacturers have weighed these conditions carefully in locating their levers.

In regard to the brake lever, other difficulties enter—that is, plenty of throw is required in order to set the brakes with power and at the same time provide sufficient clearance to prevent dragging. This means that if the forward position is moved back within very easy reach the "on" position will be past center and a great inconvenience to people getting in and out of the car with the brakes set.

As for engineers getting together on fixed set of dimensions for these points, I believe it would be well-nigh impossible, owing to the balancing of the various points brought out in your article and the points above, which call for compromises to suit the general public.

I believe we sent in the dimensions of our Model 56, which is probably one of the cars measured mentioned in your article.

In regard to folding wheels, we have noted carefully on one model which adopted them that the drivers never used them in spite of the fact that it was a little difficult to get out on the "off" side, but it was more difficult to fold the wheel, even though the device was fairly simple.

Working on Adjustable Seats, Toeboards, Door Locations, Etc.

By G. G. Behn

Chief Engineer Hudson Motor Car Co.

MR. SCHIPPER has covered a good many important points in connection with the design of automobile bodies in his article appearing in THE AUTOMOBILE for Feb. 3.

Undoubtedly, the reason that so many bodies are designed with improper seating space or entrance space is because the the body is usually the last item which is given any consideration. A chassis is first designed and wheelbase determined, and after this has all been done then the body is designed. In a great many cases insufficient space is allotted for the body, which brings about the crowded conditions mentioned in Mr. Schipper's article.

We have been working for some time on a scheme of determining sitting positions and door openings which will enable us to get conditions exactly as they will be reproduced in the finished body, including the upholstering. In other words, the seats, toeboards, door locations, etc., will all be adjustable. When completed, we believe that the device will be very valuable, as it will eliminate all guess-work as to what is correct in the way of body dimensions.

—

To Develop Light-Weight Ploughs

By Marius C. Krarup

IN this column, issue of Feb. 10, I mentioned some reasons for the belief that the development of light tractors and the use of light motors for farm work, to take the place of the heavy machinery or of the animals now employed, depends wholly upon the simultaneous development of soil-milling tools and methods, by which the movements for working the soil are made to assist in the propulsion of the machine.

You omitted, however, my closing paragraph, for the sake of which the rest was written. No doubt, the omission was due to the exigencies of your space. What I suggested was that the most practicable way for developing light soil-milling machines for use on farms, where they cannot be adopted unless they are sure to pay for themselves from the start, is to gain experience by designing and building them in sizes and types suitable for suburban gardens, whose owners are not so closely bound to either economy or ownership of the machines. While my suggestion was not worded more ex-

plicitly, I assumed that every American familiar with suburban and village life in the United States would at once see a picture projected on the movie-screen of his own mentality to the effect of some enterprising young business man in the locality making suitable arrangements with a maker of soil-milling machines, on one side, and with owners of gardens and garden truck farms, on the other side—enabling all to get their soil tilled at a fair price and in quick order, each successive year getting the advantage of improvements in the construction of the machines without the burden of individual investment. I could go much farther with this suggestion, as regards construction as well as in the industrial and sociological features, but fear to encroach on your space with a subject in which only a minority of automobile manufacturers, engineers and users are interested.

Where would the automobile industry be to-day, however, if the public had not carried the main burden of experimental work from 1895 to 1903? And—assuming that soil-milling as distinguished from plowing, is necessary to let the automobile industry into the manufacture of farm motors and tools—how many years will it be likely to take before good results are reached, unless the burden of constructive experimentation is distributed somewhat, as may be done on the plan suggested? The new-born enthusiasm for fancy farming and gardening under the auspices of city people, for which the automobile is largely responsible, should be like mother's milk for the infant soil-milling machine.

Detroit S. A. E. Has Big Meeting

(*Concluded from page* 360)

he, but he noticed the drivers all hanging on to the steering wheel, sitting up quite straight. He also remarked that he has sat in a few cars himself at high speed which had a low back seat and does not like it.

E. T. Birdsall, Kosmath company, speaking on the matter of body comfort, heartily endorsed a recent article in THE AUTOMOBILE entitled, "Drivers Lot 99 per cent Discomfort." He agrees with the idea of making an effort to put more comfort into the bodies. At the Detroit show, Mr. Birdsall remarked, he went around with a friend who was going to buy a car and tried four of the very well-known makes, and in not one of them could he sit in the front seat, put his feet on the pedals and keep his knees away from the steering wheel. He said that comfort is a point that designers would do well to pay a great deal of attention to.

Chase Favors Transmission Brake

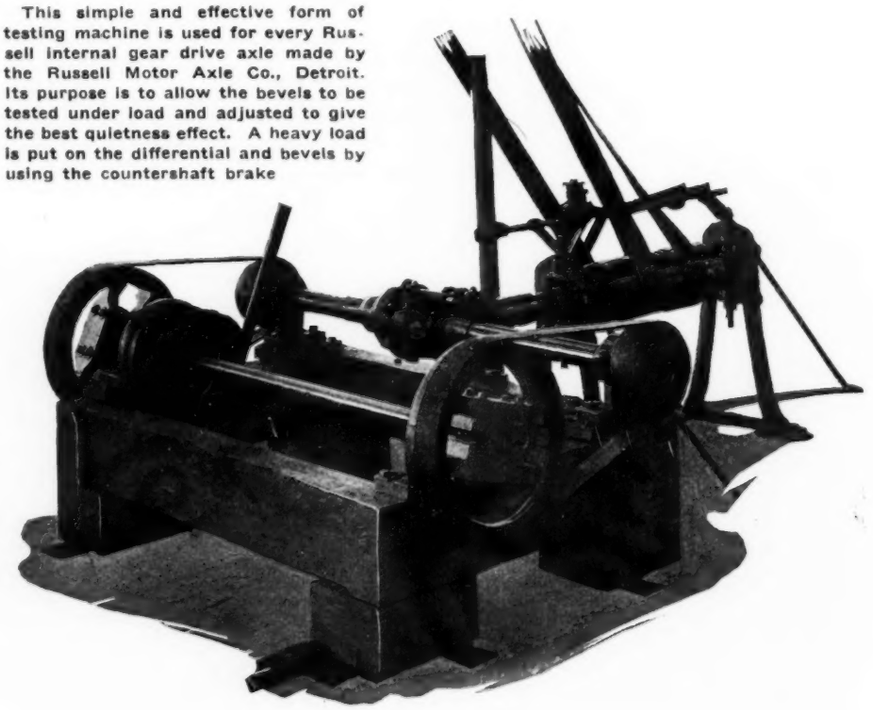
Regarding brakes, which were also dealt with in the paper, Herbert Chase, laboratory engineer A. C. A., spoke in favor of the propeller shaft type. "It is not very much seen in American cars, but it has some possibilities which warrant more consideration. There is also another point which, perhaps, should have quite a little emphasis, and that is the very poor average carburetion that we have on cars. I think it is safe to say that perhaps 10 to 15 per cent of the fuel that is used is never fully burned, and the products of combustion contain large quantities of CO which in itself is a mark of decided inefficiency in carburetion. I look for improvement in that line.

J. G. Vincent, chief engineer of the Packard company, touched upon the body-seating matter and said that while he personally was in favor of the low arm-chair type of seats, it is his experience that the higher seated cars sell more readily. For rough roads he thinks the fairly straight seat more comfortable because it allows one to brace himself to better take the bumps. The remarks regarding brakes, Mr. Vincent thinks, are very timely and that engineers must put more study on them. He thinks front wheel brakes are fine in theory, but they have the objection of increasing the turning radius which, of course, is not desirable. On this point Mr. Vincent said that someone may get up a mechanism to operate a front wheel brake and still keep a short radius, and it would certainly be a good thing. He also commended the steering qualities of the average high-grade car to-day.

As to the matter of transmissions, Mr. Vincent said that he could not possibly agree with the paper where it says there is going to be any tendency toward hydraulic or electric transmission. After looking the situation over thoroughly he believes the answer to be along the lines of a flexible motor. As to the aluminum motor, he said, this is certainly a very interesting development. There are no doubt some things to be solved in it, such as keeping it properly warm in the winter time, not having to take too much time to warm it up, and so forth. Regarding the statement in the paper that power falls off badly in a motor of small cylinder bore, he stated it to be his opinion that the power falls off in a larger percentage in a larger cylinder, on account of the larger valves and the inability to keep the valves in good shape.

Importance of Heavy Oil Experiments

There was very little time left for the author's reply, and Mr. Clayden confined his attention to the question of heavy oil experiments. He stated that he had observed so many disappointments in the development of chemical methods for making gasoline from heavy oil that he had lost faith in chemists. If the high price of gasoline is due to shortage the heavy oil engine is a necessity, and if the price is not due to shortage, then the coming of heavy oil engines will force those responsible for holding up gas prices to ease them off again. Either way there is advantage in developing heavy oil automobile engines as rapidly as possible.



This simple and effective form of testing machine is used for every Russell internal gear drive axle made by the Russell Motor Axle Co., Detroit. Its purpose is to allow the bevels to be tested under load and adjusted to give the best quietness effect. A heavy load is put on the differential and bevels by using the countershaft brake

Milwaukee—Le Roi Motor Designed for Simplicity

Few Moving Parts with Integral Construction Used Wherever Possible—Thermo-Syphon Cooling, Unit Crankcase and Cylinders with Detachable Heads

UNDER the model name Le Roi, the Milwaukee Machine Tool Co., Milwaukee, Wis., has brought out a motor which it has designed especially for simplicity. The motor is for light work, and the brake-horsepower curve shows the motor to reach its peak at about 2300 r.p.m. at which speed it develops about 28 hp.

Moving parts have been cut to the minimum possible with present design and what moving parts there are are completely inclosed when the engine is in the car. The cylinders and crankcase are cast in one piece, and in addition to the rigidity which this construction gives to the engine, tending to prevent cramped bearings and crankcase warping, the bearings themselves are of ample dimensions. This gives a simple rigid structure which is a sample of the policy followed throughout the entire design.

Convection Cooling Employed

Cooling is by thermo-syphon with special attention given to the water spaces around the valves and cylinders. An example of this is that there are no less than fourteen openings between the cylinder and cylinder head through which the water circulates, the head itself being detachable in order to give access to valves, pistons, combustion chamber, etc.

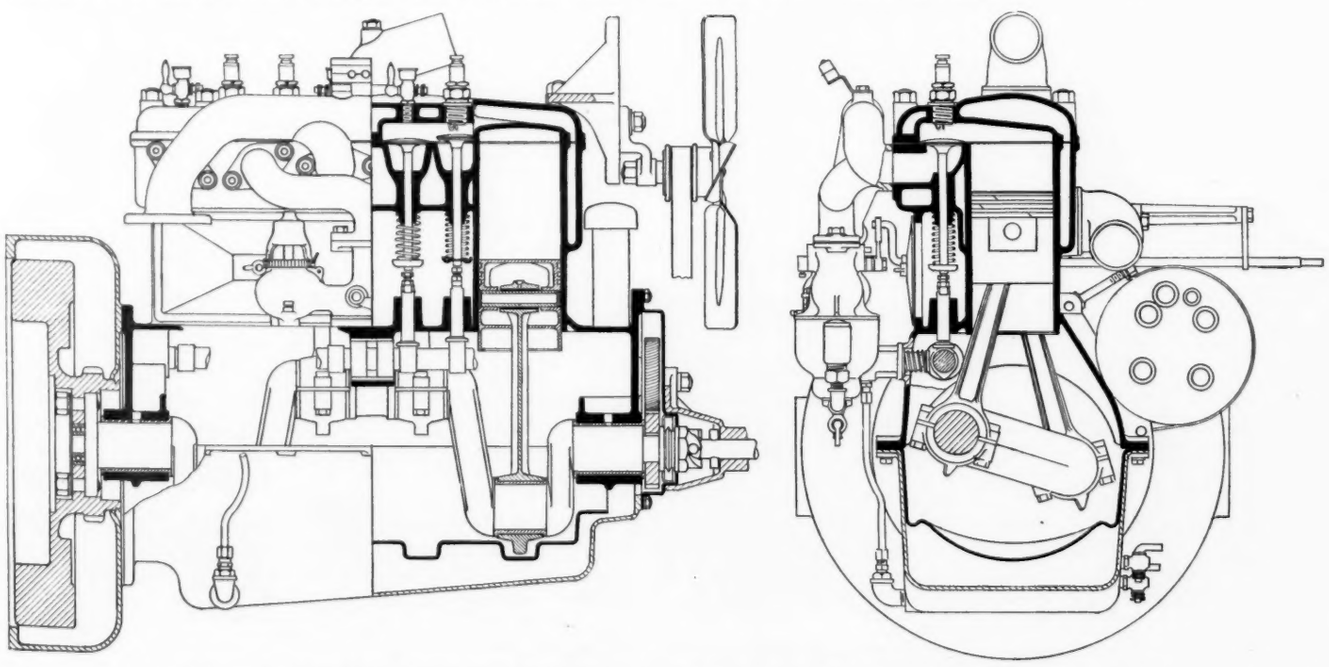
Equal simplicity is found in the lubricating system which is a combination pump and splash. Oil is pumped from the reservoir by a simple positive plunger pump to pockets over the camshaft bearings, whence it flows through the channels provided to pockets over the main crank bearings and from there to the constant level splash troughs and back to the reservoir. The pistons, wrist pins, and timing gears are all lubricated by the spray of oil formed by the connecting-rod splashing into the constant level tray.

Direct Valve Action

Referring to the sectional illustrations, it will be noted that the valve action is simple and direct. The valves are of large diameter and are actuated directly from the camshaft through a mushroom type push rod. Adjustment for clearance is provided in the usual manner between valve stem and push rod. In the sectional illustration the ample water-jacketing space around the valve stem guide is clearly shown.

The cylinders are 3⅛ by 4½ fitted with gray iron pistons closely machined and by careful distribution of the metal as light as possible. The pistons are flush top with three rings above the wrist pin and the piston pins driven into the bosses in the casting. The connecting-rods are I-beam section of light weight and the crankshaft is supported on two main bearings. A spiral gearset drives the camshaft which is of integral construction.

The bell housing for the flywheel is No. 4 S. A. E. standard and there is a ball bearing in the flywheel to support the front end of the transmission driveshaft.



Part longitudinal and transverse sections though the Le Roi motor made by the Milwaukee Machine Tool Co.

The Rostrum

Oil Geology of Goshen Valley, Utah

EDITOR THE AUTOMOBILE:—I notice in THE AUTOMOBILE the price of gasoline steadily advancing, some people giving as a reason scarcity of crude oil. This prompts me to ask a question which I confess is out of your line of work, but since you are interested in automobiles and gasoline you might give me the desired information.

I am living in a valley where there are a number of springs that at times show traces of oil, also an abandoned well on my ranch has shown oil at times to such an extent that stock would not drink from it. Some well diggers have tried to dig wells here and find a layer of rock so hard they cannot get through it with a common drill. One man who had worked with a drill in oil fields said he thought if a person could drill through this layer of rock he would strike oil.

I am told that these indications are very similar to those in the Big Horn Basin, Wyo., where they drilled and found large quantities of oil. This country, to my knowledge, has never been examined by an expert oil man, and any information whereby someone could be induced to make an honest effort to test it out would be very much appreciated. T. L. S.

Elberta, Utah.

—Elberta is located about 9 miles east of Eureka, Utah, in a district which was mapped in detail in 1897 by the United States Geological Survey. The map and associated description are embodied in the Tintic special folio, No. 65, of the U. S. Geological Survey, which is obtainable from the director of the Geological Survey at Washington, D. C. for 25 cents.

The rocks of Goshen valley, in which Elberta is situated, consist of sands and gravels in terraces, bars and deltas, comprising the lake bed series of the extinct lake Bonneville; and they are underlain by andesite and rhyolite lava flows in sheets of uncertain thickness.

As far as it is possible to tell from the general geology, as described in the folio, the area in and around Elberta does not appear to be favorable to the occurrence of quantities of oil.

THE AUTOMOBILE is indebted to the Department of Geology, Columbia University, for assistance in tracing down this inquiry.

Formula for Flow Through Pipes

Editor THE AUTOMOBILE:—I should like to know the principle of operation of a gear pump. Will one operate against a pressure of 5 kg.?

2—What is the formula for determining the flow of a liquid through a pipe? Given a pressure of 5 kg., a pipe diameter of 15 mm., a Saybolt viscosity of 300 sec., please explain fully how to determine the number of liters of oil delivererd per second.

3—Is it possible to make an accurate fit in a dog coupling as shown in the sketch, Fig. 3. I wish to use such a construction in the divided center bearing of a two-piece crankshaft. What method of procedure would it be necessary to employ to make and fit same accurately? F. H. W.

New York City.

—The principle of a gear pump is simple, as it consists merely of two gears rotating within a chamber. The pump chamber is so arranged that the side of the two gears coming into mesh are in the intake compartment and coming out of mesh in the exhaust compartment. The oil is led in, and as the gears come into mesh it is picked up in the clearance space between the teeth and thrown out on the other side. By a pressure of 5 kg. it is presumed that you mean a pressure of 5 kg. per square centimeter. This is equivalent to about 70 lb. per square inch, which is slightly above the capacity of the usual gear pump.

2—Unless you give the pressure in kilograms per square centimeter or some other square unit, it is impossible to interpret your inquiry. There are a great many formulæ for flow of liquids through pipes, depending on the nature of the pipe and various other factors. The theoretical formula for quantity discharge is $Q = ac\sqrt{rs}$, in which a is the area in square feet, c the coefficient of flow, r the mean hydraulic depth or the area over the perimeter, and s equals slope or head divided by length of pipe. To obtain definite values in this formula to substitute in order to secure a definite result, it will be necessary for you to take a hydraulic table and secure your head from your kilograms per square centimeter figure and your other variables from the kind of pipe you are using, etc.

3—It would seem possible to make an accurate fit on the clutch you have sketched in Fig. 3 by grinding the engaging surfaces of the jaws.

Oil Used Probably Too Light

Editor THE AUTOMOBILE:—What is the address of the Northway Motor & Mfg. Co., which manufactures the four-cylinder motor of the model 43 Oldsmobile?

2—Which is the best oil to use in the transmission of the model 43 Oldsmobile? Some tell me to use same as in the motor.

3—What causes the first two cylinders to have poor compression and the spark plugs to be coated with carbon and oil? I use a light oil. It is a valve-in-the-head motor, and the car has run only 1100 miles since it was bought last Fall.

4—Please give me the horsepower curve of the four-cylinder 3½ x 5 valve-in-the-head Northway motor.

5—Does it shorten the life of a storage battery more if it is used for ignition as well as for starting and lighting, or only starting and lighting, if the battery is always kept charged and supplied with water?

6—Which gives the brighter light—a 6-volt lamp or a 7-volt? The battery is a 6-volt storage, and what is the right candlepower to use? Does it harm the battery to use 7-volt lamps? Will a 7-volt lamp burn out as easily as a 6-volt?

7—What per cent difference will a speedometer show that is driven by the driveshaft over one that is driven by the front wheel on the average country roads?

8—Can you give me a sketch or description that will show me how the oil is fed into the different troughs under the connecting-rods, and does it make any difference if machine stands lower in front, as my floor is 2 in. lower? Does it feed an equal amount of oil into each trough? T. A. F.

Kenosha, Wis.

—The Northway Motor & Mfg. Co. is located in Detroit.

2—A heavy oil should be used in the transmission. The oil should be poured in up to the countershaft.

3—Try a medium oil in place of the light. It is hardly possible that the rings are worn as yet.

4—The horsepower curve of the Northway 3½ x 5 overhead valve motor is not at present available.

5—No.

6—On a 6-volt circuit the 6-volt lamp will give the brighter light, although its life will not be as long as the 7-volt. The candlepower can be anything you choose, but the greater the candlepower the more current will be consumed. Lamps which are up-to-date burn about 1 watt per candlepower. It does not harm the battery to use 7-volt lamps, and a 7-volt lamp will not burn out as quickly as a 6-volt on a 6-volt circuit.

7—This figure cannot possibly be given, on account of the great number of varying factors which enter. No doubt, however, if the same car could be equipped with independent speedometers with the two methods of drive, an average figure should be secured, but of this THE AUTOMOBILE has no record.

8—The fact that the car stands on a slope should not affect the oiling system as each trough is fed independently. You can readily test the oil level in the well yourself, as there are four plugs on the right side of the crankcase near the bottom which may be removed and the oil level ascertained.

Hudson Uses Three-Brush Regulation

Editor THE AUTOMOBILE:—Please describe and give advantages and disadvantages of semi-floating, three-quarter floating and full-floating axles.

2—Kindly publish wiring diagram of the new Delco system, third brush regulation, as used on Hudson super six.

New York City. F. W. W.

—See THE AUTOMOBILE for Dec. 2, page 1004.

2—This is shown in Fig. 1.

Connecting Trouble Lamp on 6-42 Kissel

Editor THE AUTOMOBILE:—I have a 1916 6-42 Kissel, and would like to know the best way to connect the wiring to attach a socket on the motor side of the dashboard for an electric trouble extension lamp, the Westinghouse lighting system being used on this car.

Newark, N. J. L. S. H.

—The trouble lamp should be a two-wire type with one wire run directly to the ground and the other wire connected to the tail light circuit. This will leave the socket alive whenever the tail light is in operation and the consumption of current will only occur when the trouble light actually needed is inserted in the socket. If you desire to use the equipment already on the car the instrument light is connected with a removable shelf so that the lamp bulb can be taken out and the plug connection of the trouble light inserted. Therefore, an extra socket is not needed unless you really desire to install one.

Use Graphite Paint to Prevent Rust

Editor THE AUTOMOBILE:—What is the paint to use on the rim of the wheel to keep it from rusting? G. W. C.

Portland, Me.

—Graphite paint is probably the best to use on the rim of a wheel to keep it from rusting.

Information on 1912 Model Everett

Editor THE AUTOMOBILE:—I have recently come into possession of a 1912 Everett model 36 and would like to know what the original equipment was as to ignition, carburetion and transmission systems. I also would like to know the bore, stroke and rating of this engine and the maker's name.

Haverhill, Mass. E. E. S.

—The standard ignition equipment on this car was the Splitdorf and the carbureter was a model H. Holley; the starter system was a Deaco-Prest-O-Lite. The transmission system was an integral part of the rear axle housing manufactured by the Everett company.

The bore and stroke are 4 by 4¾ with four cylinders and a rating of 38 hp. They were manufactured in the Everett company's shop. The cylinders are cast in a block.

Wiring Diagram of Moline-Knight

Editor THE AUTOMOBILE:—Kindly show me by diagram the lighting and starting system of the 1914 series of Moline-Knight.

2—Where is the proper place to connect a spotlight in this car?

3—Could this light be connected to the wires leading directly from the storage battery, if a 12-volt bulb is used?

4—Where should an ammeter be connected in this wiring system?

5—Whenever I refill the battery to the proper level with pure rain water and then charge it by allowing the motor to run, the water in four of the cells starts rising and then almost overflows. I then remove the excess water in these cells after which it does not rise any more. Does this prove these four cells defective or is the water chemicaliy impure; might it be that these four cells are filled up too much, thereby preventing the gas to escape, and then cause this expansion?

Chicago, Ill. E. D.

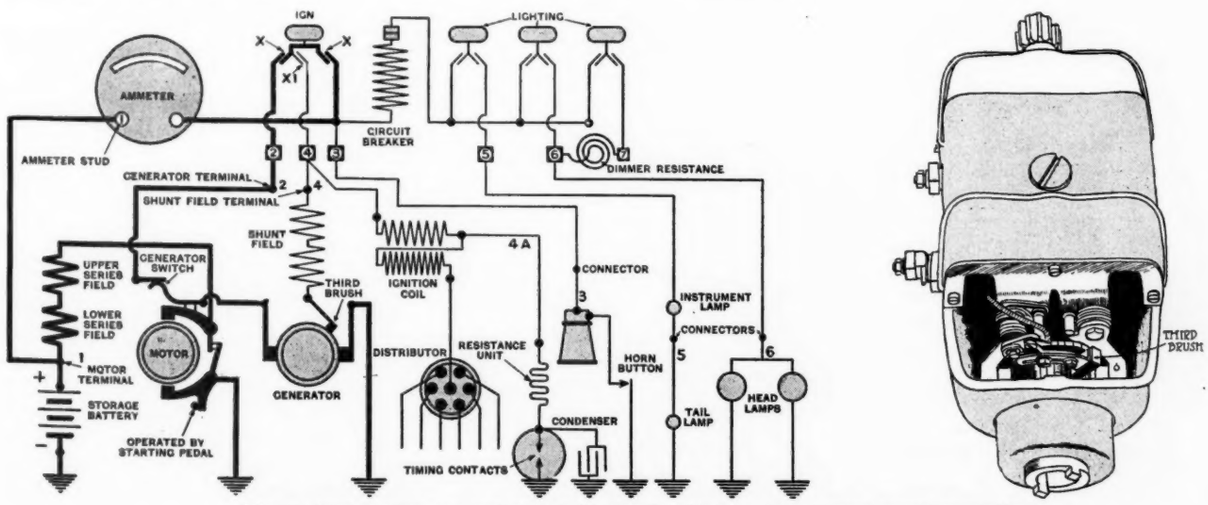


Fig. 1—Wiring diagram and sketch illustrating Hudson-Delco third brush regulation

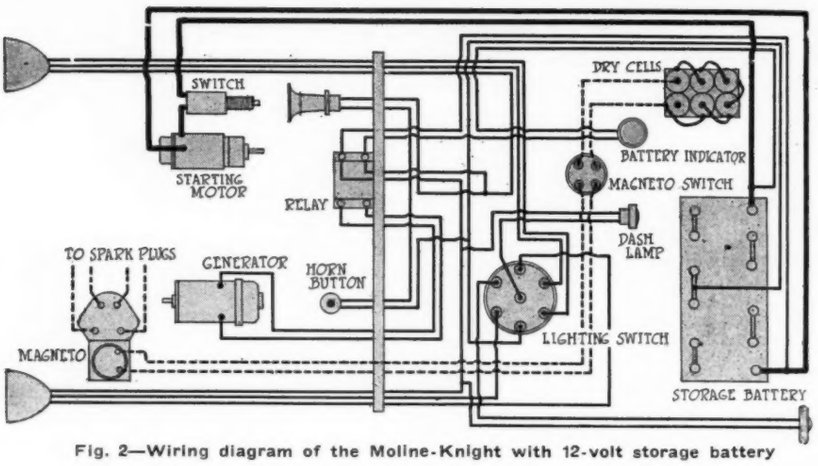


Fig. 2—Wiring diagram of the Moline-Knight with 12-volt storage battery

—The diagram for the lighting and starting system of the 1914 series Moline-Knight is shown in Fig. 2.

2—As there is a 12-volt battery in this car in using a 6-volt bulb the proper thing to do is to connect one side to the neutral side of the switch and the other side to the green or negative wire on the battery.

3—If a 12-volt bulb is to be used it can be connected to the main lead from the storage battery. This is a three-wire cable and the connection should be made on the red and green wires back of the panel board and lighting switch.

4—The wiring diagram shows where the battery indicator should be connected. If an ammeter is to be used in place of the battery indicator the same connection can be utilized. If both are wanted, put the ammeter in series with the indicator.

5—The Moline company uses a six-cell 12-volt battery in this model. If the battery is run down and filled to the proper level with pure rain water the expansion of the plates will cause the water to rise and does not indicate that the cells are not in normal condition. If the water in the other two cells does not act similarly and they contain the same amount of water as the others, it indicates that the solution in these two may be too weak.

Reasons for Slipping Clutch

Editor THE AUTOMOBILE:—I am owner of a six-cylinder car equipped with a disk clutch. The car is geared about 3.3 to 1 with a large wheel and I have experienced trouble in clutch slippage.

Not taking into consideration whether the clutch is too small or not properly constructed, would a lower gear ratio have a tendency to keep the clutch from slipping, or not?

When giving answer will you please give reasons why condition would not be changed or why it would be made better or worse?

Martinsburg, W. Va. C. E. G.

1—A lower gear ratio would tend to keep your clutch from slipping. The reason for this is that the amount of energy through any given period of time transmitted through the clutch is less with the lower gear ratio for a given car speed.

There are two factors in the transmission of horsepower. One is the foot pounds of energy and the other is the time. If the time is increased the foot pounds energy is decreased. Since the revolutions per minute can be considered as a time factor it is quite evident that in transmitting a given horsepower through the clutch the energy at the clutch will be less when the speed of the crankshaft is higher.

Bulbs for Ford Magneto System

Editor THE AUTOMOBILE:—I have a 1916 Ford and am desirous of changing the headlamps. I have a new pair of headlights wired for two bulbs, head and dimmer. I find on taking these lamps apart that the upper bulbs are marked 6.5 volts and the lower ones are 9 volts. I bought these lamps with the understanding that they were for a 1916 Ford. What I wish to know is this: How can I wire these new lamps in series, as the old lamps were, when I bought the car? There are only three wires coming from each lamp. Kindly give diagram.

Allentown, N. J. H. R. D.

—The lamps you have purchased are not the standard Ford lamps and the Ford company has no intention of installing equipment such as this upon its cars. The 9-volt bulbs of your lamps may be wired in series with the magneto but it would be impossible to wire the 6.5 volts to the magneto on account of the low voltage of the lamps which would cause the bulbs to burn out. Storage batteries could be used for the smaller lamps. This is a rather clumsy arrangement, however, and much better results could be obtained by using the standard Ford lamp.

Freezing Point of Charged Battery

Editor THE AUTOMOBILE:—Will a charged storage battery freeze in cold weather? If so, at what temperature?

2—How low does the battery have to be run down before it freezes?

3—How often should a battery be charged when not in use, say, stored for the winter? Some have taken their batteries out of their cars and put them in the cellar. Is it advisable to put them in cellars, or not?

4—Does it injure a battery to let it run clear down.

Plainville, Ill. A. A.

—A charged storage battery will freeze in cold weather and the temperature at which it will freeze depends upon the state of the charge.

2—Storage batteries will freeze in accordance with the following table:

Specific Gravity 1.150	Battery empty, 20 deg. below zero.
Specific Gravity 1.180	Battery three-quarters discharged, zero.
Specific Gravity 1.215	Battery one-half discharged, 20 deg. below zero.
Specific Gravity 1.250	Battery one-quarter discharged, 60 deg. below zero.

3—Storage batteries should be recharged at least once a a month. Putting a battery in a cellar will not damage it if it is placed in a dry place and where the temperature is known not to go below 20 deg. above zero, and kept fully charged.

4—A storage battery should not be discharged below a point of 1.7 volts, per cell. A battery is not injured if discharged to this point and immediately recharged. The plates will deteriorate more rapidly if discharged below 1.7 volts per cell and is also injured if left standing in a discharged condition for any length of time.

Ammeter Connection on Chalmers 24

Editor THE AUTOMOBILE:—In your issue of Jan. 27, E. O. H. C. asks about installing an ammeter on a model 24 Chalmers. I have installed on my machine, of the same model and make, a Weston double scale ammeter reading to 10 amp. on charge and 40 amp. on discharge, voltage to 20.

By measurement I have found that the maximum discharge on throwing the lever to start is 70 amp. which is only for an instant, the needle immediately dropping to below 35. I have had this installation on my car for two years with perfect

success. The circular that comes with the ammeter shows how it should be cut in.

San Francisco, Cal. N. A. ROBINSON.

Clock to Match Stewart Speedometer

Editor THE AUTOMOBILE:—Could you tell me where I can get a clock to put on my 1916 Maxwell to match the Stewart speedometer that is on it. It is a flush face with narrow nickel rim. It requires a very thin clock, for the space is small between the cowlboard and gas tank. I wish to pay about $6 to $10. The Waltham people supply the Cadillac with a type that would fit only it is too expensive.

Providence, R. I. F. J. R.

—The Stewart-Warner Speedometer Corp. manufactures an electric clock which matches the speedometer. This sells for $15. It is an electric device by means of which one small dry cell will keep the clock wound automatically for six months. It can be installed face flush with the dash and it is believed that there is sufficient room between the cowlboard and gasoline tank on this Maxwell to make its installation possible.

Thomas 35 a 1907 Model

Editor THE AUTOMOBILE:—When was the model 35 four-cylinder Thomas built? What is its bore, stroke, power, weight and speed?

2—I am considering remodeling one into a racer. Is it sufficiently modern to have high grade materials in it? Will two-point ignition from a Bosch double magneto increase the speed?

3—Where can I obtain aluminum pistons for this car?

4—Where can I obtain the right grade of channel steel to strengthen the frame which is continually cracking?

Gallon, Nev. A. D. D.

—The model 35 four-cylinder Thomas was built in 1907. Its bore was 5½, stroke 5½ and rated horsepower 60. THE AUTOMOBILE has no record of weight and speed.

2—Yes.

3—Aluminum pistons can now be ordered through any large garage and machine shop as there are now a number of manufacturers.

4—Any low carbon steel will be sufficiently strong to strengthen this frame as the frame in itself must be almost strong enough to sustain the stresses.

Adjusting Willys-Knight Worm Drive

Editor THE AUTOMOBILE:—Will you kindly advise the proper means of adjusting the wheel on the worm drive of a Willys-Knight 1914 car when no index is available?

2—Can the ball bearings of the front wheels be replaced with Timkens without buying new spindles and hubs?

Port Henry, N. Y. F. E. B.

—The adjustment of this wheel is taken care of on each side of the differential by means of shims. It is an adjustment that a repair man should be able to determine readily. The Willys-Overland company states that an allowance should be made of at least 0.005-in., as if the adjustment is too tight a severe binding occurs resulting in the early destruction of the gears. If excessive allowance is used it will result disastrously in that the gears would pound themselves to pieces. In making the adjustment it is suggested that just enough play be allowed to be perceptible between the mesh of the two gears.

2—The Willys-Overland company advises that this can be done.

Lever Slips Out on Rough Roads

Editor THE AUTOMOBILE:—I wish you would publish through the Rostrum a solution that would help me out.

1—My 1914 Packard 2-38 slips out of high gear about every 5 miles if the street is rough, while on country roads it is much worse. I have tightened the top and lower springs that hold the pinion, without results. I have examined the gears and found them as good as new, the connections on the gearbox are all right and it goes in high into full mesh but seems to work out.

2—I have had the crankcase taken off and a 3-in. square piece was broken out behind the starter. Because of the mechanics' failure to take off one of those nuts I had it welded by an expert and the job looked good but in drilling the hole it was cracked about 1½ in. down the side and I am using the car. I don't want to have the car tied up for a couple of days so can you recommend a way that I can temporarily repair it. I have tried shellac but the oil seems to work through.

3—I also have a 1916 Ford. Can a battery be charged from this car's magneto by changing the current to direct? If so, please give full explanations and mention objections if there are any.

Reading, Pa. C. E. A.

—The strongest probability is that the two plungers that drop into grooves in the gear shifter shaft to retain it in any of its four positions are not operating properly. It may be that these plungers have frozen in their guides or that their points have been badly worn, but it is more probable that when the shift to high is made the second speed pinion bottoms in the internal clutch of the direct drive gear before the proper lock groove on the shifter shaft has come squarely under the plunger. If this is the case the rear rod to the shifter shaft may be disconnected and the shaft screwed into the shifter fork until there is left 1/16 in. for travel of this mechanism after the lock plunger has dropped into the clutch but before the second speed pinion bottoms as above described.

If any of the above possibilities should exist it is very possible that in going over uneven roads the driving pressure on the gears might stop momentarily at the sudden slackening of the motor speed just when a sufficient jolt to throw the gears out of mesh was received.

2—From the description given the exact location of this crack is not evident, but the chances are all for its being readily accessible although the motor is in the frame. If so, it would be but a half hour's job for an experienced man to warm up the spot to the proper temperature, clean it and fill the crack very nicely with aluminum solder. Care in using the solder must be taken to avoid oxidization.

3—Yes, by installing a rectifier, but this would be so expensive and troublesome that it would not be worth while. It is not a practical thing to do.

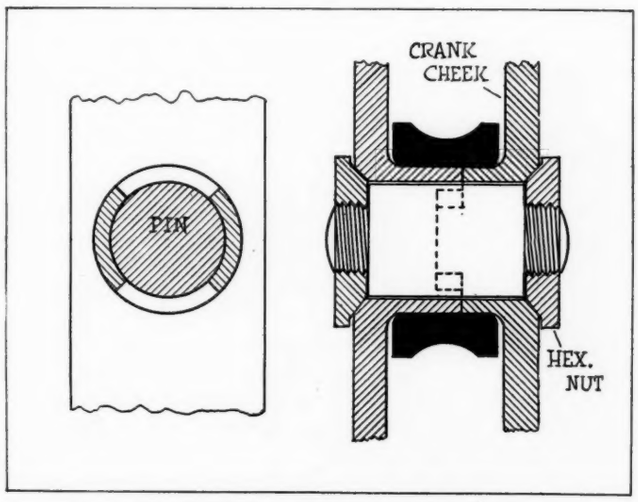


Fig. 3—Suggested jaw clutch for crankshaft connection

The History of the American Automobile Industry—18

Use of Hot Tube and Catalytic Ignition—Perry's Double-Acting Engine Which Resembled a Steam Design—First Induction or Step-Up Coil Invented by Ruhmkorff in 1852 Wins Napoleon's Prize

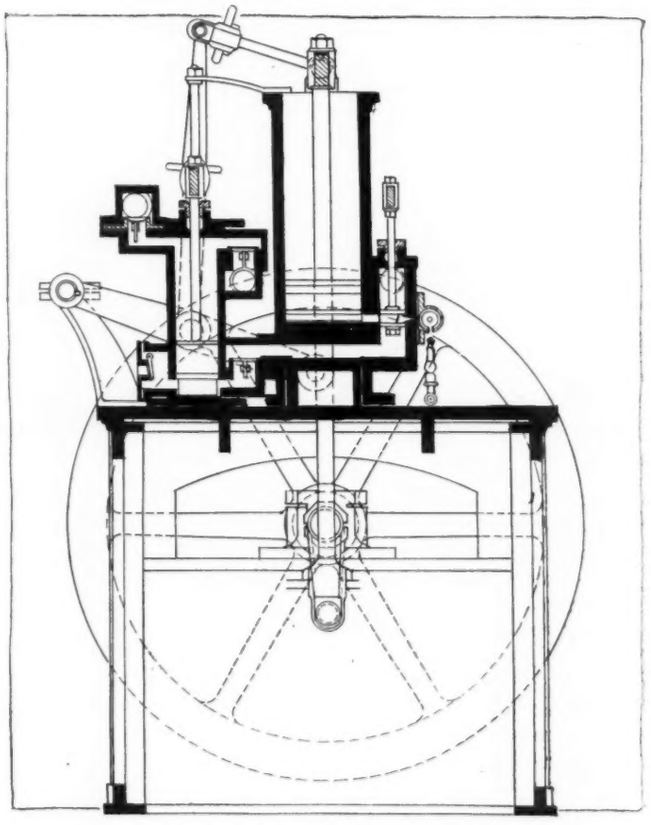
By David Beecroft

IN his British patents, 1615 to 1838, William Barnett shows several valuable ideas. He tried to introduce compression, although it is doubtful if he succeeded in securing much compression in the cylinder, owing to some delay between the ignition and the closing of the admission mechanism, during which time the piston was moving away from the ignition end, and thus reducing the compression.

It was common to ignite the non-compression engine by a flame on the outside of the cylinder and a hole through the cylinder wall, which was uncovered by the piston, after it had moved far enough to get in a partial charge. Some power naturally escaped through the hole, and Barnett, by his devices overcame this objection. He introduced the igniting plug or cock which would be filled with gas from the cylinder, turned round to the flame and ignited and again turned back to the cylinder, where it transferred the flame to the working charge. This igniting device was much used in later years, sometimes as a rotating plug and sometimes as a sliding one. Barnett also shows catalytic ignition and seems to have employed fine platinum wire or sponge for this purpose.

Beginning about 1835 a very persistent American worker, Dr. Alfred Drake of Philadelphia, began experiments which lasted for more than 20 years. During this time he developed an engine that is best known abroad, probably because more widely marketed in England and France by Lenoir. Instead of the jump spark as used by Lenoir he ignited by internally placed hot tubes, these tubes being kept hot by a flame blown into them by a pipe entering from the outside and igniting the mixture which surrounded them by their red heat. One of these engines exhibited at the Crystal Palace in New York in 1858 was seen by many people, who, later learning of the Lenoir, pronounced it the same as Drake's.

Another inventor whose patent descriptions give us much information and whose advertisements appeared in the magazines of that time, was Stuart Perry of New York, whose patents, Nos. 3597 of 1844 and 4800 of 1846, show what even to-day seem to be practical internal combustion engines. He used turpentine for fuel, but mentions that other liquid fuels were usable. The older patent described an air-cooled engine, whereas the later one shows water cooling.



Barnett Gas Engine

Double Acting Engine Tried

Perry's engine was double-acting, being built much as a steam engine. Its action was that of a two-cycle much like the Lenoir of later years, except that the air and vapor were forced into the working cylinder by pumps instead of being drawn in by the piston movement. The new charge was ignited by flame ignition when the piston had traveled about one-eighth of its stroke, which gave considerable length of stroke yet remaining for expansion and, therefore, must have been fairly

economical; in fact, it much excelled Lenoir (years later) in this respect because Lenoir did not ignite his new charge until well toward the center of the piston movement.

Perry says that sliding or other valves may be used but he shows rotating cylindrical valves with ports cut in the sides thereof, like the Duryea of 1906 and the Darracq of 1907. His liquid fuel was vaporized by the heat of the cylinder and of the exhaust gas after the engine was started.

Of his air cooling, Perry said: "I prefer to inclose the cylinder and its immediate appendages in a case through which cold air may be blown by means of a rotary fan or other blowing apparatus which may be operated by the engine in any convenient manner." This air-jacket idea for the cylinder is still in use.

In his water-cooled engine he not only surrounded the cylinder with water, but lubricated the piston and inside of the cylinder with water, which both prevented wear and overheating.

In this engine Perry introduced platinum ignition, a form that received much attention from gas-engine inventors about that time. One of the most important features of his patent of 1846 "consists in the employment of a receiver containing condensed (compressed) atmospheric air for starting the engine, in combination with another receiver and with an air pump, . . . said pump being operated by the engine." Thus do we find both from Perry and from Cayley of 9 years earlier, that the self-starting of an air or gas engine was a matter worthy of their consideration. The starter idea is not new to the twentieth century, but is one more example of the grasp inventors had of the problem in 1840.

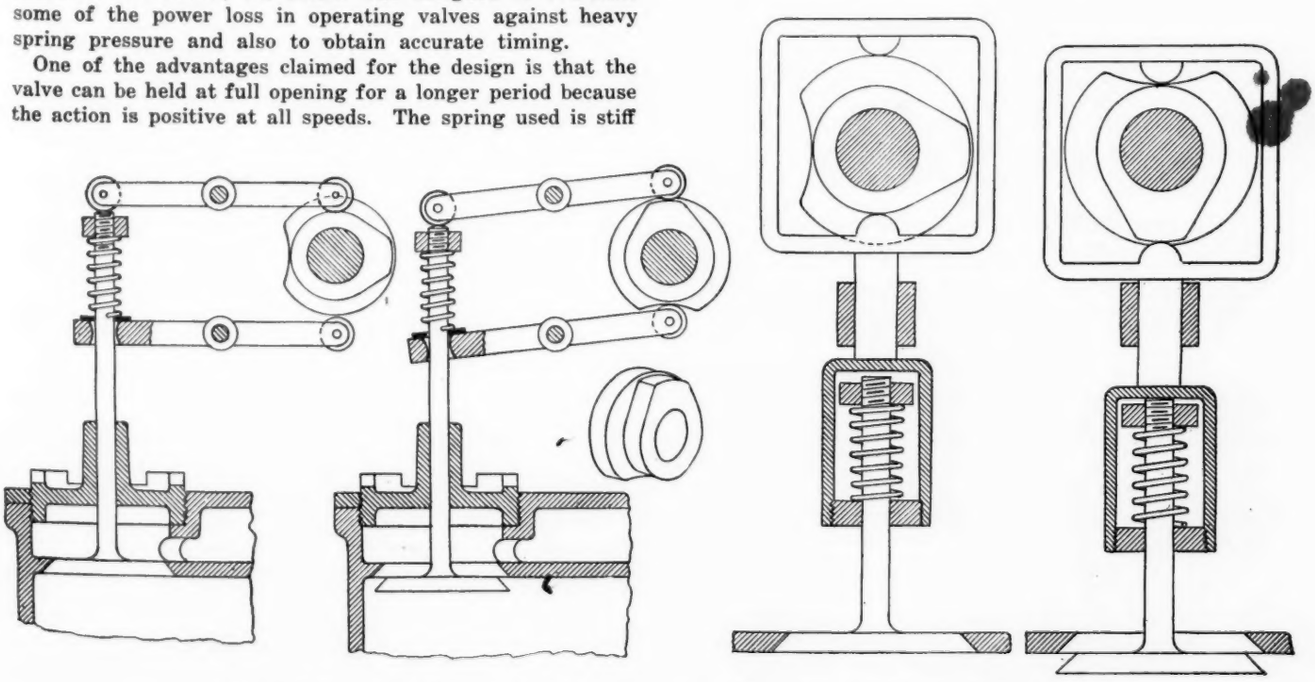
Start of Coil Ignition

Coincident with the work of Drake was the development of the step-up induction or double-coil now used in connection with all jump-spark ignitions. This coil is commonly termed a Ruhmkorff coil, because in February, 1852, the Emperor Napoleon of France offered a reward of 50,000 francs to the man who could produce the most important electric invention during the next 5 years, which period was extended later to a further 5 years. This award was finally given to H. D. Ruhmkorff, a Paris instrument maker, for inventing this coil. It was, however, first developed by Prof. Chas. G. Page of Washington, D. C., following the researches of Faraday, Joseph Henry and W. Sturgeon, about 1831. It should, therefore, more properly be termed Page's coil. As early as 1838 Professor Page and J. H. Abbott built some large induction coils, and in 1836 N. J. Callan described the jump or induction coil having a vibrator or interrupter. This coil was, therefore, well known in America before the award to Ruhmkorff, or its use in a gas engine by Lenoir.

Valve Action Designed to Reduce Power Loss

IN view of the recent controversies on valves and valve spring pressures, a design which was originated by F. F. MacVicar of Syracuse, N. Y., in 1907, is of interest. As the illustrations indicate, the action was designed to overcome some of the power loss in operating valves against heavy spring pressure and also to obtain accurate timing.

One of the advantages claimed for the design is that the valve can be held at full opening for a longer period because the action is positive at all speeds. The spring used is stiff enough to insure the cam acting on the valve, but is arranged to give only slightly when the valve regains its seat, thus preventing the closing cam from bottoming.



Methods of utilizing MacVicar valve mechanism with direct and finger following actions

Dodge Motor Assembly Progressive

System Follows Modern Method of Detail Building Up in Stages

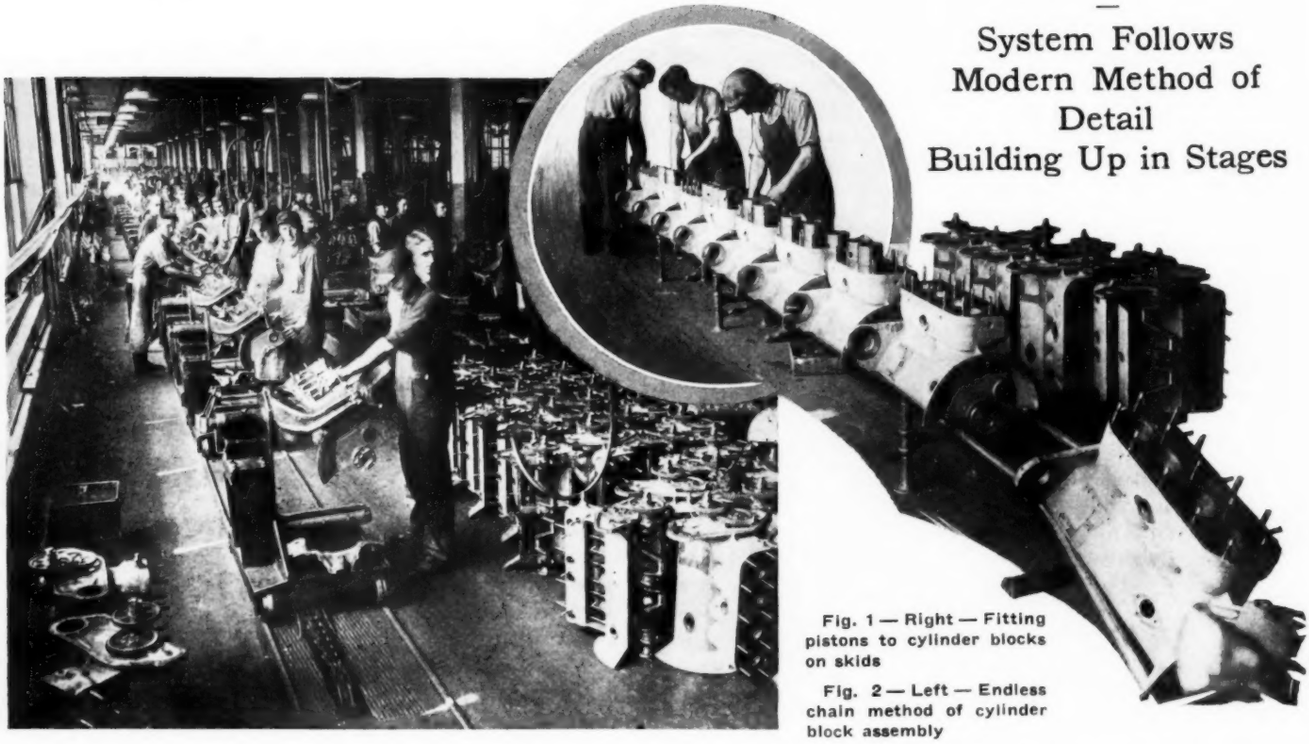


Fig. 1 — Right — Fitting pistons to cylinder blocks on skids

Fig. 2 — Left — Endless chain method of cylinder block assembly

THE two views here shown give some idea of the extensive manufacturing facilities now used by Dodge Bros., Detroit, Mich. They illustrate two phases of the progressive motor assembly department where over 400 motors are assembled daily.

Fig. 1 shows the cylinder blocks after the crankshaft and camshaft have been installed, and the crankshaft bearings properly fitted. The valves have been fitted and ground into their seats, each one being numbered, so that if they are removed at any time, they will be properly replaced. The cylinder blocks are slid onto skids so as to be in the most accessible position for fitting the pistons. The connecting-rods have already been fitted to the crankshaft which is in the cylinder block, and have been numbered properly, so that they can be reassembled in the motor when the proper sized pistons are attached to them.

Correct Balance Insured

Racks of pistons are placed conveniently beside the skids and so arranged that each bin contains pistons of exactly the same weight, so that for each cylinder block, pistons are taken from the same bin, thus insuring a proper balance of the reciprocating parts, as the connecting-rods are also matched in the same way. Each cylinder is then fitted individually, so that the clearance between the cylinders and the piston is exactly the thickness of a 0.003-in. ribbon feeler. The pistons are then stamped on the top to insure their being assembled in their proper places. After they have been fitted in the cylinder blocks the pistons are sent over to an assembly bench, where piston rings of the proper sizes are fitted to them and where the connecting-rods are attached to them and the wristpins locked in place.

With the assembly of the connecting-rod, wristpin and piston complete, all these parts which have been fitted separately for the cylinder block are ready to be installed in it as a unit. This is done after the cylinder block has been placed on the line of the universal assembling stands.

Fig. 2 shows the double line of the cylinder block assembly. Each block is clamped in place in one of the universal assembling stands, which run on tracks and are propelled by an endless chain. After the block has been clamped in place it can be turned over to any one of four positions.

On the universal assembling machine are placed a cylinder head, gearcase cover and piston and connecting-rod assemblies. The smaller units are arranged in bins along the tracks of the assembling line, where the different groups of workmen perform their particular tasks in turn.

The mechanics in the center foreground are installing the valve springs. The next group of men are about to install the piston and connecting-rod assembly, which has been previously fitted.

The third group is mounting and adjusting the starter generator, and connecting up its silent chain drive to the crankshaft sprocket. Similarly, all the way down the line, each group of men has its particular task to perform.

Each Operation Is Checked

Inspectors are stationed along the assembling lines so that each operation of the assembly is carefully checked up. Also each following inspector has an opportunity of seeing that nothing has slipped by the attention of the previous inspection. Thus, by the time the engine has been completed, an extremely thorough inspection of the cylinder block and its parts has been made. When the end of the cylinder block assembly line is reached, the completely assembled gearsets are brought up to the cylinders and bolted on. The power plant is then removed and conveyed upon a special truck to the block test, to be run in and tested under its own power. The universal assembling stand is then returned to the start of the line by a third chain and track.

ACCESSORIES

THE accompanying illustration shows the latest type Van indicator, a Van speedometer with an Elgin watch. This type of speedometer is named the Spedistemeter by its manufacturer. The speed and distance recording part of the instrument is identical with the regular type of Van speedometer, but the Elgin watch is incorporated in a rather unusual manner. The watch dial is set in the main dial of the instrument and connected by a shaft with the watch works in the back. These works are at the back of the instrument and can be removed by unscrewing a cap. The winder and reset, as illustrated, is operated from a watch stem in the same manner as the ordinary watch. The winder and reset can also be operated from a knurled button which projects through a collar directly under the watch dial.—Van Sicklen Co., Elgin, Ill.

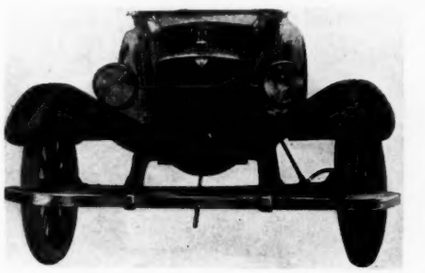
Van Sicklen Spedistemeter including Elgin watch

Evergood Channel Bumper

Under the name of Evergood a channel bar bumper has been brought out for the special purpose of taking care of the needs of Saxon four owners. The streamline design of the Saxon car is carried out, the bumper arms being curved in such a way as to seem to lengthen the wheelbase of the car.

The bumper can be installed in 20 min. according to the manufacturer without the use of any drills or other implements outside the tools which are regularly in the repair kit. The arms are malleable castings and the springs which absorb the shocks are inclosed in tubes.

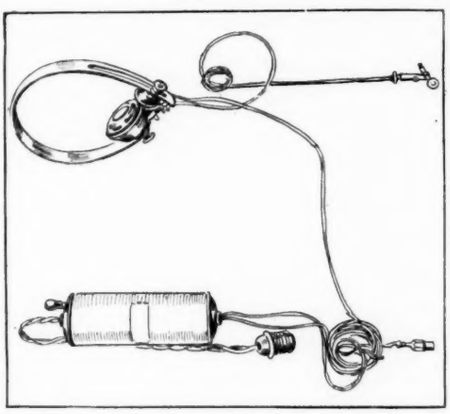
The round bar with nickel finish retails for $5.65; the combination black and nickel finish for $5.05. The channel bar bumper retails for $6.45. The diamond shape bumper with nickel retails for $7.05 and the combination black and nickel finish $6.45.—Emil Grossman Mfg. Co.



Evergood channel bumper for Saxon four

Nodelay for Sealing Punctures

The Nodelay puncture-sealing compound is in the form of a liquid which is injected into the inner tube where it forms a coating over the inside and the balance of the compound remains in the tube as a liquid. The reason for this is that the compound does not adhere to itself but has a great affinity for rubber. It is claimed that, should a puncture occur, thus baring the rubber, the Nodelay liquid in the tube immediately forms a coating which seals the puncture. The compound is said to be unaffected by changes in temperature or weather conditions and to be soluble in water, so that, should any of it get on the clothes or any part of the car during the process of injection, it may be readily washed off. Injection can be done by any car owner or repairman. A 12-oz. bottle sells for $2, which is sufficient for a 30 by 3½ tire. A 20-oz. bottle or sufficient to treat a 37 by 5½ tire, sells for $3.—Nodelay Mfg. Co., Chicago, Ill.



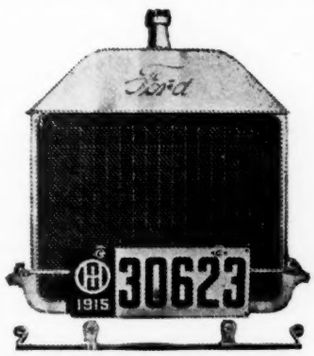
Boss electric circuit testing outfit

Boss Circuit Tester

Any electrical circuit may be tested with this apparatus for grounds, short circuits or open circuits. A plug is screwed into any 110-volt alternating or direct current lamp socket, the telephone receiver placed on the head, where it is held by a band, and the terminal clips on the testing wires placed on the ends of the circuits to be tried out. A clear closed circuit is indicated by a clicking sound in the instrument. The amount of current consumed is so small that it will not affect the meter, the makers state, and the device cannot burn out. It sells for $12.75.—Maroa Mfg. Co., Maroa, Ill.

Tomarin License Holder

This license holder is a stout steel bar arranged to be bolted down by the radiator holding bolts of the Ford and extends across the lower part of the radiator. Sliding clamps are adjustable to any width of license plate. The bar adds to the stiffness of the radiator, the makers state, and holds the license plate where it does not interfere with the air coming through the radiator. The holder sells for 75 cents.—William Tomarin, Cincinnati, Ohio.



Tomarin license holder for Fords

Peteler Jack

An ingenious feature of this jack, which operates by means of pawls on a stepped lifting bar, as shown in the illustration, is the automatic drop bar. When the car is to be lowered, the oper-

Peteler jack with automatic drop bar

ator presses the button on the side of the jack and it flies to reverse and the moment the weight of the car is removed the lifting bar drops automatically, rendering any pumping of the handle unnecessary. The jack is durably made, a large pressed steel shell forming a base reinforced by a wooden block. All parts of the device, in fact, are of pressed and hardened steel, including the pawls, while the lifting bar turns freely, distributing wear. The round swivel lifting bar allows greater freedom in placing the jack than is ordinarily possible. Another point is that the fulcrum is placed very low, giving greater upward play to the handle and preventing the operator's knuckles from striking the ground. For cars with low hung axles, a special head with a low step is provided. The jack is finished in black enamel and nickel. With the regular head it sells for $3.50 and with special drop head, for $4—Moreau & Pratt, Inc., New York City.

Roller-Smith Ammeters

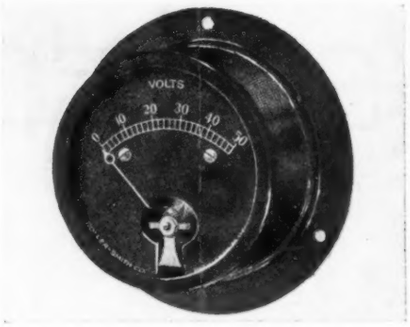
Ammeters and voltmeters made under the name Roller-Smith are for dash installation, the case being of heavy brass with rubberoid finish which is said to be dust and moisture proof. The overall diameter of the instruments is 3½ in. and the depth 2⅝ in. Prices run from $5.30 to $7.—Roller-Smith Co., New York City.

Lion Economy Trailer

This trailer has a capacity of 1000 lb. and is mounted on two wheels 34 in. in diameter with 1¼ in. solid rubber tires and running on Timken roller bearings. The axle is of 1¼-in. steel. The body is 42 by 72 in., of box form and has 8-in. panels and heavy hard wood sills, braced and ironed. Hard wood flare boards and a tail gate are fitted. A coupler is used for attachment to the rear of the car, and this is done without injuring the finish of the machine. The weight of the trailer is 375 lb.—Lion Buggy Co., Cincinnati, Ohio.

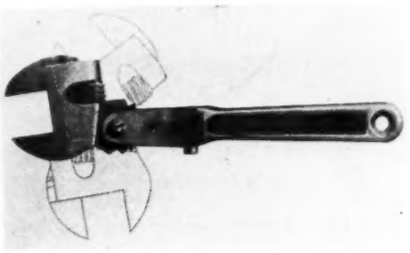
Kelco Batteries

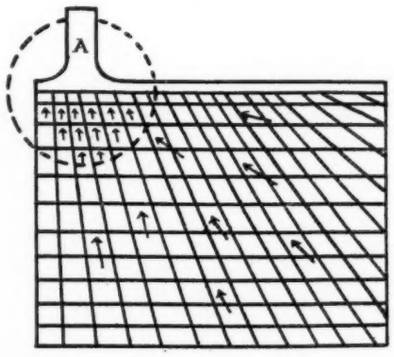
This starting and lighting battery, in which an effort has been made to obtain greater efficiency by improving on the plate design, has been brought out under the name of Kelco. It is pointed out by the makers of this battery that while in charging the current is stored in all parts of the plate it is drawn out through but one point, and that is A at the corner of the plate. Accordingly, the makers have made the lines on metal ribs converge toward this corner, with the result that more metal is concentrated at the outlet. According to the theory of construction of the Kelco battery this puts the material where it is necessary. Other refinements of this battery include an incased handle to guard against corrosion and in a corrosion-proof terminal connector.—Storage Battery Appliance Co., Baltimore, Md.



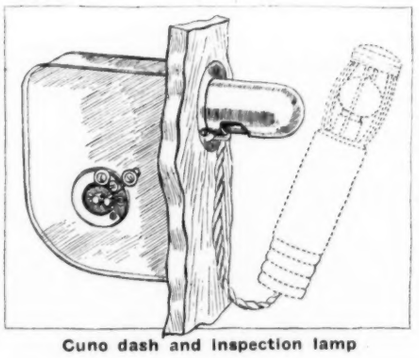
Roller-Smith ammeter for dash installation

Lion 1000-lb. Economy trailer


Imperial angle wrench, showing some positions



Kelco battery plate, showing converging ribs


Cuno dash and inspection lamp

Imperial Angle Wrench

This is an end-opening, adjustable wrench, but the head, instead of being integral with the handle, is swiveled to it so that it can be turned through a very wide range and locked automatically in any one of eight different positions. A retaining ratchet, released by a button, holds any adjustment. The tool can be used as a ratchet wrench under certain conditions by pressing the button to permit the ratcheting action. The adjustable jaw will take any size up to 1¼ in. —Imperial Tool Co., Bloomington, Ill.

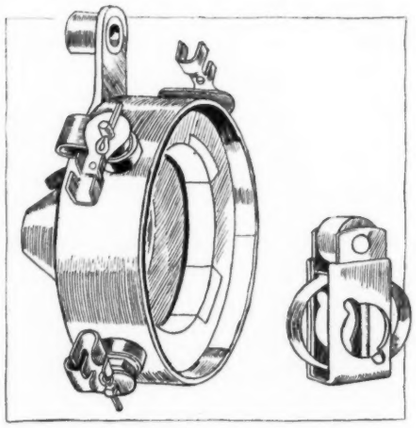
Cuno Dash Lamp and Timer

The Cuno dash lamp is combined with a trouble lamp, the handle of the latter disappearing into the dash together with a 15-ft. cord. The cord is automatically wound by a spring-operated reel in a sheet steel housing at the rear of the dash. Dash and trouble lamp combined sell for $4.25 without bulb; without bull's-eye for $4; and with reel and housing only $2.25.

The Cuno timer for Ford cars is made of steel enameled to prevent rusting, the fiber ring being of specially-heated, hard gray bone fiber, while the spring wire terminals guard against loose connections. The roller is carried in a slide, a large flat spring pressing it directly against the contacts. Price, $1.50.—Cuno Engineering Corp., Meriden, Conn.

Mansfield Top Dressing

This is called Never Leak Waterproof Dressing and is said to be impervious to water and dampness. No paint, varnish, shellac, linseed oil or asphaltum are used in its composition and it does not become stiff. A quart suffices for a roadster top and a half gallon for a five-passenger touring car. A pint sells for 60 cents, a quart $1, ½-gal. $1.75 and 1 gal. $3.—Mansfield Mfg. Corp., Syracuse, N. Y.


Cuno timer for Ford cars

The Automobile

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Body Measurements

CRITICISMS on body design, as made in a recent article in THE AUTOMOBILE, have touched a responsive chord, if the correspondence received on the subject can be any indication. These letters from representative engineers in the industry show that the belief is general that the driver, who, in an actual majority of instances, is the owner, is neglected. Some of the letters are published weekly in the Engineers' Forum department over the signatures of their senders.

Owners have been so gratified to secure efficient performance that they have allowed the feeling of delight in acceleration and economy to completely hide their feeling of resentment at being compelled to double up, jack-knife fashion, in driving, and it is time that a remedy be found for this trouble. To paraphrase Lincoln's famous epigram, the way matters stand at present: All of the people fit some of the cars, some of the people fit some of the cars, but most assuredly all of the people do not fit all of the cars, nor will they until cars are ordered like suits of clothing, by measurement, or a considerable amount of adjustability is offered.

However, it is possible to go a step further and say that some of the cars do not fit any of the people, because they have 5 and 6-in. passages through which anatomies must be squeezed; because the shifting of gears is accompanied by a stretch which almost brings the chin against the steering wheel or because the foot cannot be put upon the clutch pedal without a collision occurring between knee and steering column.

It must certainly be admitted that body design cannot be standardized nor will it be until some mythical date when all human beings are cast in the same mould. Therefore the best that manufacturers can do is to meet the requirements of the man of average stature in working out the stock design. Surely one who is fortunate enough to be of normal proportions ought to reap the benefit of being as nearly standardized as a human being can be, by feeling comfortable in a car designed to meet the needs of average proportions.

Earlier Winter Bodies

IT is to be hoped that the error of delivering winter automobile bodies to dealers in January and February instead of in September, October and November will not be repeated next fall. Many dealers who specified deliveries on closed jobs for last October found them starting to come through in December. The same manufacturers in a few cases want to force the dealer to show closed jobs at such shows as Minneapolis, Kansas City and Des Moines. Dealers in these cities can sell many closed cars but not in January or February. They must make their sales in October, November and December. Buyers of closed winter cars want immediate deliveries, particularly in cities west of the Mississippi where they have not learned to place their orders in May for October delivery. For dealers to sell and make deliveries in October, the cars should be on the floor Sept. 15. It is unfair of manufacturers not to give this service. The dealer deserves every assistance in this new field in Western cities, and those makers who are most considerate in this respect will receive greatest results.

Supply and Demand

IT is frequently difficult to distinguish between cause and effect, and just at present it is hard to determine to what extent the features of automobile design which are now the rule are effects of public demand or causes of it. Occasionally it is possible to be positive, as for instance, in the case of the eight-cylinder engine, for this undoubtedly was not demanded till the first American eight had made its bow to the public. After that moment the increase in the number of eights was certainly due to demand for them.

The automobile itself was not demanded, but rather it was forced upon a distinctly unwilling public in Europe and America alike. So with many features of present-day chassis they were created by engineers and, proving good, made their own demand. The moral of it is that features which prove good when thoroughly tested may be incorporated without much regard for convention. Nothing is a freak to-day, provided it does the work.

Traffic Situation Unchanged

Shipments in Feb. Expected Will Be Equal or Larger Than in Jan.

DETROIT, Feb. 21—Although there is no improvement in the general freight car situation so far as automobile shippers are concerned, it now looks as if the shipments of cars during February, which is a short month, will be equal to or even greater than were the January shipments, which totaled more than any previous month in the history of the motor car industry. No actual figures are yet available bearing on the number of automobiles thus far shipped this month, but from his daily reports, J. S. Marvin, traffic manager of the National Automobile Chamber of Commerce, is able to predict a total for February that may even outdo January's record.

Thus it is apparent that even though the manufacturers are handicapped by lack of railroad equipment and are not able to produce as many cars as they would like to on this account, they are doing better than ever before. There is no telling what the total production and shipments would be if the makers were able to ship all the cars they could make and for which they have immediate shipping orders. But when it is realized that there are in the whole country not over 60,000 automobile freight cars, it is really a wonder that it is possible to move the great number of machines that are moved each day. It speaks well for the efforts of the Chamber's traffic department, as well as the co-operation between the dealers receiving the cars, the railroads and the factories. The 10,000 new automobile freight cars for which the railroads placed orders some months ago, and which have been held up in manufacture due to lack of wheels and other steel parts, are now just beginning to put in their appearance. There are probably 200 to 300 of them already in service and more are coming right along. This will undoubtedly help the situation somewhat.

Some interesting sidelights on the present shortage of cars and the shipments of the previous year are given by the figures herewith which show the number of cars shipped each month during 1915. It will be seen that the January, 1915 total was outdone by 9685 carloads by January of this year, and even September, the palmiest month of 1915, was 864 below the present year's start. If proportionate increases are shown during this year it is difficult to see what the September, 1916, shipments will be. But if the shortage of cars continues, it is very likely that a much greater number of automobiles will be driven over the roads to their destinations from the factories than ever before.

Carload Shipments of Automobiles for each month of 1915

January	8,369
February	11,273
March	16,442
April	17,112
May	13,642
June	15,325
July	12,517
August	15,359
September	17,190
October	16,138
November	15,000
December	16,050
Total	174,417
Add shipments reported late and not distributed in their month	30,000
Total carloads 1915	204,417
Carloads shipped during January, 1916.	18,054

Lewis R. Speare Dies

NEWTON, MASS., Feb. 23—Lewis R. Speare, former president of the A. A. A., died at his home here to-day after an illness of several weeks. He was taken to a hospital in January and operated upon for cirrhosis of the liver. Early in February he was brought home, and the physicians in charge stated that he could not recover, his death being a matter of strength.

Lewis Robinson Speare was born at Boston, Mass., June 6, 1861. He came of Puritan stock, having been traced back to 1647, while others were officers in the Revolution.

Mr. Speare was one of the first men in this country to take up motoring. Like everything else he became interested in he proved a dominant force. When the Massachusetts Automobile Club was formed he was one of its early members.

When the Bay State A. A. was formed in 1905, Mr. Speare was chosen president. He was re-elected and did much to get it started along a prosperous career. His activities as head of that organization brought him into the limelight, for he attended all the meetings of the American Automobile Association.

So when the organization needed a strong executive officer in 1909 he was chosen for the position. It was one of the best moves ever made by the association.

Cline Sun Factory Manager

ELKHART, IND., Feb. 17—B. J. Cline will join the Sun Motor Car Co., this city, in the capacity of factory and production manager. Mr. Cline has been identified with the automobile industry since 1898, at which time he assisted in building the first Pierce-Arrow car. Since then he has been with the E. R. Thomas Motor Car Co., Buffalo, N. Y., and later the Chalmers Motor Car Co., Detroit. He then joined the Chandler Motor Car Co., Cleveland, which was just being organized at the time.

The Sun company is now producing cars and will build ninety cars during the month of March.

Thomas To Drive Peugeot

Winner of 1914 Indianapolis Race Will Appear May 30 on Hoosier Track

PARIS, Feb. 17—*Special Cable*—Rene Thomas, winner of the 500-mile race on the Indianapolis Speedway in 1914, will drive a Peugeot in the 300-mile contest scheduled for the Hoosier track on May 30.

The above cable was received as THE AUTOMOBILE for Feb. 17 was on the press, so that it was possible to print it in only part of the edition.

Three Speedway Events for Tacoma

TACOMA, WASH., Feb. 17—Three series of racing events for this season are announced by the Tacoma Speedway Assn. —the first on Decoration Day, the second on July 4, and the third and largest racing event on the Pacific Coast this year, the Montamarathon Aug. 5.

Coupled with this announcement was the further one that F. G. Fisher has been elected president of the association to succeed Frank Allyn, resigned on account of ill health.

A number of short racing events featuring Northwest drivers will be staged on Decoration Day, and which will include a 100-mile event.

The Montamarathon on Aug. 5 will be for a prize of $10,000, with a bonus to the driver finishing the first 100 miles in the best time, and a like bonus to the man finishing the 200 miles in the best time. The race distance will be 300 miles instead of the former 250 miles.

Stutz Denies Rumors

INDIANAPOLIS, IND., Feb. 21—Rumors to the effect that Stutz cars may be seen in racing again, have been denied by the Stutz Motor Car Co. As stated by Mr. Stutz immediately after the Sheepshead Bay race in New York, his cars will not enter racing again until someone breaks or equals the world's records that the Stutz now holds.

$100,000 Corporation to Manufacture Electric Steel

MILWAUKEE, WIS. — Another large corporation to manufacture electric steel has been organized in Milwaukee. It is the Pelton Steel Co., capital stock $100,000, backed by several large bankers. An electric steel foundry will be established at once. The incorporators of the new concern are Fred Vogel, Jr., president, First National Bank; Gustav A. Reuss, vice-president, Marshall & Ilsley

Bank, and William H. Schuchardt, architect and capitalist. The foundry will have a 3-ton furnace. Several large steel foundries in Milwaukee have recently installed electric furnaces of large capacity, and Leo G. Smith, well-known steel founder, is building a large foundry, the Electric Steel Casting Co. of Milwaukee, capital stock $300,000, having been organized for this purpose. Several other founders are contemplating the purchase of electric furnaces.

—

Gridley Adams Leaves Stewart-Warner

CHICAGO, ILL., Feb. 21—Gridley Adams, advertising manager of the Stewart-Warner Speedometer Corp., is leaving that company to join the Macavoy Advertising Agency of Chicago, having bought an interest in that company. This agency has just secured the Jeffery account. With Mr. Adams will be several other men well known in the automobile field, especially the advertising field, namely, Frank Morse of the Mahin Agency; Berry Rockwell, late of the Mahin Agency and formerly advertising manager of the Maxwell-Briscoe Co., and with *Saturday Evening Post*, and G. N. Bryant, formerly with the Locomobile, Franklin and Moline-Knight.

Mr. Adams has been advertising manager of the Stewart-Warner Corp. for three years. He was formerly advertising manager of the Stoddard-Dayton Co., the United States Motor Co. of New York, and also the Aeolian Co., New York.

—

Lane Motor Truck Co. Formed

KALAMAZOO, MICH., Feb. 15—The Lane Motor Truck Co., is being formed with a capital stock of $25,000 to make a 1200 to 1500-lb. truck, with four styles of bodies, express, open flare board, stake body and stationary top flare body.

—

Maxwell to Sell Light Delivery

DETROIT, Feb. 22—The Maxwell Motor Co. is entering the light delivery car field. No special car will be made, but as the company believes that its standard chassis is well adapted for such a purpose, it will furnish the touring car chassis complete with cowl, instrument board and electrical equipment, but without body, at $565, or $90 less than the price of the standard touring car. Purchasers will receive a scale of dimensions which will enable any body builder to fit any type of body to the frame.

—

McCulla in Aeroplane Work

DETROIT, MICH., Feb. 19—William R. McCulla, who recently rejoined the engineering staff of the Packard Motor Car Co., has been given charge of the aeroplane motor division of the engineering department.

Aluminum Castings Increase Output

—

Castings Made Jan., 1916, Total 1,709,000 Lb. More than in Same Period of 1915

DETROIT, Feb. 22—While new customers are finding it difficult to obtain aluminum at present, those who have contracts with the casting companies are being well served. A year ago the Detroit plant of the Aluminum Castings Co. was about the right size to care for the demands made upon it, and to-day it is running at so high a pressure that extension in the early future is planned.

For the company's three plants at Detroit, Cleveland and Buffalo, the output of aluminum castings for January, 1916, exceeds that of January, 1915, by nearly 2,000,000 lb., and well over 90 per cent of the whole output goes to the automobile industry.

Cadillac to Use Aluminum Bodies

Of this increase about 125,000 lb. was cast in the form of permanent mold pistons, since no less than 123,000 of these were shipped during January, and they weigh a trifle over a pound apiece. During 1916 it is expected that well over 5000 aluminum cylinder castings will be made, and it is possible that this number will be doubled if the opening of the Southern plant of the American Aluminum Co. in April has the effect on the supply of metal that is anticipated.

The Detroit plant of the Aluminum Castings Co. has lately been supplying the Cadillac Co. with thin panel castings for their coupe body, and it is understood that all future Cadillac bodies will be of this material. At present the limousine will be built as before, but it is planned to use cast aluminum for this body also as soon as the casting plant is able to handle the business. The system of construction employed is exactly tht same as that which has now been used for many years by Pierce-Arrow.

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States Motor Car Mfg. Co. Formed—Capital $600,000

KALAMAZOO, MICH., Feb. 17—The States Motor Car Mfg. Co., with a capital of $600,000, has been organized and will immediately begin manufacturing a line of eight and four-cylinder passenger cars and a four-cylinder truck. The plant formerly occupied by the Michigan Buggy Co. will be used.

The officers of the new company are: President, J. A. Ply; first vice-president, B. R. Barber; second vice-president, J. H. Johnson; and secretary and treasurer, Samuel Hoekstra.

The board of directors are as follows: J. A. Pyle, H. E. Johnson, B. R. Barber, G. B. Pulfer, Ira Cadwallader, W. B. Smith, and J. H. Johnson.

The output will be 10,000 cars a year. About 5000 cars will be built the first year.

The Light Car Axle Co. has leased 20,000 ft. of floorspace in the east building of the plant and has entered into contract with that company to supply all the front and rear axles for its cars.

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Two New Studebaker Trucks

DETROIT, MICH., Feb. 23—*Special Telegram*—The Studebaker Corp. has announced two new models of commercial cars of 1-ton and ½-ton carrying capacities. The intention is to build 10,000 of them during 1916, and although the corporation has been building commercial cars of ½-ton capacity for several years, it has never attempted production of business vehicles on so large a scale before.

There are three body types fitted to each of the chassis. On the ½-ton are fitted a panel delivery body at $875, an open express design at $850 and a station and baggage wagon at $875. The 1-ton chassis carries either an open express body at $1,200, a stake body type at $1,250 or a sixteen-passenger bus at $1,400. Among the features are an electric starter and lights and a speedometer.

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Overland Breaks February, 1915, Record

TOLEDO, OHIO, Feb. 18—On Feb. 11 the Willys-Overland Co. had broken its February, 1915, shipping record by over 500 cars. In other words, during the whole month of February, 1915, the company shipped 5627 Overland cars, while this year this total was shipped in less than half the month.

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To Tax Canadian Ford $2,000,000

FORD, ONT., Feb. 19—According to officials of the Ford Motor Co. of Canada, Ltd., the share to be paid by the company to the Canadian government if the new war budget is adopted by parliament will be at least $2,000,000, of the total of $30,00,000, which, it is expected, the special budget will yield. The tax covers the period beginning Aug. 4, 1914, to Aug. 3, 1917, when it is anticipated the war will be at an end. All Canadian corporations are to contribute one-fourth of all their profits in excess of 7 per cent of the capital invested.

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Reo Ships 2000 Cars in January

LANSING, MICH., Feb. 16—During January the Reo Motor Car Co., shipped close to 2000 cars as compared with 1000 in January, 1915. More cars were ready for shipment but there were not sufficient freight cars available. Production averages 125 cars a day and this will be kept up and possibly increased to next August.

Pennsylvania S. A. E. Section Completes Organization—Hears First Paper

Officers Elected and Constitution Adopted—A. M. Dean Gives Views on V Motor—Lively Discussion of Paper—Minimum Cylinder Bore 2⅝ in.

PHILADELPHIA, PA., Feb. 16—The organization meeting of the Pennsylvania Section of the Society of Automobile Engineers was held here to-night at the Engineers' Club. The first action taken by the new section after it had been voted that a permanent organization be made, was to elect the temporary chairman, E. S. Foljambe, the temporary secretary, B. B. Bachman, and T. Y. Olsen, temporary treasurer as permanent officers to serve until the end of the administration year, Oct. 1. In addition, W. M. Newkirk was elected vice-chairman and W. H. Palmer, Jr., as held-over treasurer, This is in accordance with the constitution and by-laws as recommended by the council of the S. A. E. and which were also adopted by the Pennsylvania section. The section is affiliated with the Engineers' Club.

Paper on Eights and Twelves

A. M. Dean, engineer of the Ferro Machine & Foundry Co., read a paper on the development of the eight and twelve-cylinder V engine in which he particularly alluded to the development of his concern and outlined the considerations back of this development. In opening his paper he referred to the typical American as compared with the typical European design, stating that the American motor carries the valves in the head while European practice favors the L type, the American motor uses individual cams while the European employs the same cam for opposite cylinders. Another point of difference is in the unit crankcase on American motors while foreign practice inclines toward the employment of a separate cast aluminum crankcase.

Taking up the motor part by part, Mr. Dean first dwelt on the development of the overhead valve construction, showing how the advantages of good combustion chamber shape had been maintained while the objections of large and heavy parts which tended to become noisy had been eliminated. Speaking of the use of the offset rocker, he showed its great advantage in the high-speed motor because it allows advantageous cam shape and at the same time gives quick opening of the valves with a minimum amount of travel of the parts. As an example of the successful use of the offset rocker, the number of years of satisfactory performance of the Franklin valve system was cited by Mr. Dean. Throughout the entire consideration of the valve question, Mr. Dean brought out the fact that the high speeds at which motors are now operated have thrown into position of relative importance the details which were formerly regarded as being unimportant.

A good example of careful detail as brought out in the paper is in the threaded pin adjustment for valve clearance. This governs the position of the pivot point of the rocker arm and has the great advantage that the adjustment parts are stationary, permitting adjustment of the clearances while the motor is running. Another detail which is of relatively great importance, is in the design of the connecting-rod bearings. The rods are so arranged that the bearing split is horizontal, and the reason for this is found in the method of firing across the blocks giving a resultant which makes it necessary in order to secure the best distribution of materials and stresses that the divis on of the bearing be in a horizontal plane.

Good Lubrication Practice

Taking up the question of oiling, Mr. Dean again contrasted European practice with best American practice. He said that a great many engineers in this country had blindly followed the DeDion system of having high pressures with a short registering interval between the crankshaft opening and the oil lead in the main bearing. He stated that he had found it better practice to use lower pressures for the oil with a longer register in order to feed the oil in proportion to the bearing loads.

A motor operates at its maximum efficiency, according to Mr. Dean, when the jacket temperature is at about 170 deg. In the experiments carried out by the Ferro company with the overhead type of V motor, the author stated that the waterjacket temperature never went over 200 deg. and rarely reached that point except under the most adverse circumstances. In laying out the waterjacket it was pointed out that the water passage should run between adiacent cylinders leaving no blocks of uncooled metal in the casting.

As regards balance, the system used by Mr. Dean is to apply a counterweighting system in which each throw or unit is considered separately. For the eight-cylinder motor this means a four counter-weight balancing arrangement, and for the twelve-cylinder motor an eight-weight arrangement. The added weight to a crankshaft due to this system, he said, ran to about 34 lb., giving a total weight for the shaft of 84 lb., but he then went on to show that the evils which may arise from unchecked centrifugal force were far more serious than added weight to the crankshaft, and the use of the counterbalancing system is fully justified by results.

Fields of Eights and Twelves

Coming to the respective fields of the eight and twelve, Mr. Dean gave an answer as to where the twelve took up the work and where the eight left off. He stated that the minimum diameter for a cylinder should be 2⅝ in. Below that there is trouble due to leakage past the rings and difficulty in securing good piston fits. Not only these conditions arise, but poor thermal efficiency also results from such small diameters. This statement Mr. Dean checks up with the experiences abroad which have gone to show that 75 mm. is the limit for efficient motors. Even taking this bore as the limit, he showed that the smallest twelve is still a large motor. Mr. Dean went on to state that the unbalanced forces in an eight are 1.4 times as large as those in a four, and this naturally immediately limits the size of the eight. With the small bore and light parts the vibrations are so cut down that they do not become serious until the upper limits for eight-cylinder size are reached. This upper limit he sets at 3¼ in. with a stroke bore ratio of 1.4. This gives a piston displacement of just under 300 cu. in. The upper limit for the twelve is only the limit of the chassis, and the lower limit would be about 250 cu. in. Therefore, the field of the eights in the author's opinion ranges from 160 to 300 cu. in. and of the twelves from 250 cu. in. up.

In discussing the paper, B. B. Bachman, engineer of the Autocar Co., asked if difficulties are not found in the block cast motors if the waterjackets are not extended far enough below the piston travel. Mr. Bachman pointed out that the juncture of the waterjacket with cylinder wall created a virtual ring of metal around the cylinder which restricts its expansion at that point because of the amount of unheated metal. To this Mr. Dean replied that such a ring of metal exists and if it is not carefully placed so that the jacket is below the piston travel seizing troubles are sure to be encountered. For this reason it is the practice of the Ferro company to always extend the waterjacket well below the piston travel.

J. E. Schipper discussed the comparative merits of the side-by-side and V rod, stating that although the bearing area in the forked rod is greater than that in the side-by-side design, the advantage of the latter as regards repair work is so marked that it is well worth while to use

it if life is not sacrificed. Another point brought up by Mr. Schipper is that in starting the motor with the aluminum pistons since the clearances run up as high as 0.006 in. unless special provision is made, oil is sure to accumulate in the combustion chamber during the first few strokes. Mr. Dean answered these comments by stating that his concern, while usually building the forked type of rod, has had some motors on the road with the side-by-side installation for about a year, and found no difference in bearing life which so far could be indicated. In regard to the oiling trouble, he stated that this is overcome by the use of longer pistons and by special rings which take up the clearance and prevent excess leakage. The slight slap of the aluminum piston, however, can be noticed for the first few moments of operation.

Those present at the meeting included E. S. Foljambe; W. E. Haupt, Engineer Haupt Auto Patent Co.; W. M. Newkirk, mechanical engineer William & Harvey Rowland; T. Y. Olsen, Tinius Y. Olsen Testing Machine Co.; Albert Suttthill, chief engineer James Boyd & Bros.; Russell Hoopes, Supt. Hoopes Bros.; J. E. Chalfant; P. J. Flaherty, general manager American Car & Ship Hardware Mfg. Co.; H. R. McMahon, president of the Standard Steel Spring Co.; J. E. Schipper, technical editor THE AUTOMOBILE; W. H. Palmer, Jr., engineer Electric Storage Battery Co.; B. B. Bachman, engineer Autocar Co. Several in attendance were not members of the S. A. E.

Goodrich Surplus $10,305,679

Equal to 17.17 on Common—Net Sales Equal $55,416,866.55—32½% Gain

NEW YORK CITY, Feb. 19—The B. F. Goodrich Co. in 1915 showed a surplus of $10,305,679, equal to 17.17 per cent on the $60,000,000 common stock, as against $3,371,927 in 1914, or equal to 5.62 per cent.

Net sales for the year ended Dec. 31, 1915, aggregated $55,416,866.55, as compared with $41,764,008.66 for 1914, representing a gain of 32½ per cent. Net profits amounted to $12,265,679, compared with $5,440,427 in 1914.

The directors of the company voted, subject to the approval of the shareholders, to retire 7000 shares of the preferred stock. This is in accordance with the provision of the company's charter, which provides for the retirement of a minimum of 9000 shares of the preferred stock each year, beginning with July, 1914. As last year the company retired 2000 shares in excess of the charter requirements, it was necessary to retire only 7000 shares additional prior to July, 1916.

The company has added to its plant account during the year 1915 extensions and equipment costing $1,332,146.70, and still further additions are now under way.

	1915	1914	1913
Net sales	$55,416,866	$41,764,008	$39,509,347
Manufacturing, selling and general administration expenses	42,825,908	36,189,642	36,451,234
Net profit from operation	$12,590,957	$5,574,367	$3,058,113
Miscellaneous income	467,690	562,930	491,317
Total income	$13,058,648	$6,137,297	$3,549,429
Depreciation	734,544	573,616	541,358
†Reduction of preferred stock	11,878	.....	168,417
Interest on bills payable	46,546	123,254	239,907
Net profit	12,265,679	5,440,427	2,599,747
Preferred dividend	1,960,000	2,068,500	2,100,000
Surplus	*10,305,679	3,371,927	499,747
Appropriation for contingencies	1,700,000	.....	.....
Preferred stock red	1,100,000	900,000	.....
Pension fund	100,000	.....	.....
Previous surplus	3,177,910	705,982	806,235
Common dividend	.....	.....	600,000
Profit and loss surplus	10,583,589	3,177,910	705,982

*Equal to 17.17 per cent earned on $60,000,000 common stock, against 5.62 per cent on same stock previous year.
†Reduction of treasury preferred stock from cost to par value.
The consolidated balance sheet as of Dec. 31, 1915, compares as follows:

ASSETS

	1915	1914	1913	1912
Real estate, buildings, plant, good will, etc.	$71,502,099	$70,772,418	$71,060,802	$70,685,722
Inv. other costs	1,213,477	1,207,058	1,197,058	1,635,958
Preferred stock in treasury	775,700	1,244,200	2,058,700	2,227,117
Society Fran. B. F. Goodrich	2,121,140	1,216,256	570,987	.....
Current assets	31,242,023	20,311,557	19,401,460	24,007,698
Deferred charges	231,793	185,465	222,957	229,610
Total	$107,086,232	$94,936,954	$94,511,957	$98,786,114

LIABILITIES

Common stock	$60,000,000	$60,000,000	$60,000,000	$60,000,000
Preferred stock	28,000,000	29,100,000	30,000,000	30,000,000
Current liabilities	4,402,642	1,459,044	3,505,974	7,679,879
Reserve for contingencies	2,000,000	300,000	300,000	300,000
Pension reserve	100,000	.....	.....	.....
Surplus	10,583,589	3,177,910	705,983	806,235
*Appropriation	2,000,000	900,000	.....	.....
Total	$107,086,232	$94,936,954	$94,511,957	$98,786,114

*Appropriation from surplus for redemption of preferred stock.

From the surplus at Dec. 31, 1915, the directors voted to set aside $1,700,000 to increase the reserve for contingencies from $300,000 to $2,000,000, together with a sum of $100,000, as an initial amount, for a pension fund. The directors were led to appropriate this amount for contingencies on account of the general unsettled conditions existing throughout the world and the consequent desire to reinforce the fund available to meet unfavorable conditions should they arise.

The income account in detail is given in tabular form on this page.

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Belgian Trade Leaders Indicted

PARIS, Feb. 1—Van den Plass, the world-famed Belgian bodybuilders, Captain Masui, for many years a leading automobile agent in London, and two other Belgian subjects, are now before the military court at Calais on a charge of defrauding the Belgian Government. It is declared that the sum involved is $10,000,000 to $12,000,000, the case being so serious that the Belgian Government is acting as civil prosecutor. Soon after war broke out, the men involved were sent to England to make purchases of automobiles for the Belgian army. A little later they obtained other purchasing commissions for all kinds of material required by the Belgian army. It is declared that they have obtained enormous fraudulent profits on these transactions, and on an inquiry being opened a few days ago it was discovered that they had made cash deposits in a London bank totalling $340,000.

Before the war Van den Plass was at the head of an automobile body factory at Brussels, where he employed 4000 work people. He was generally recognized as one of the most artistic and best bodybuilders in the world.

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Buick Prices Advanced $35

NEW YORK CITY, Feb. 21—An advance of $35 in the price of the Buick light sixes has been made by the Buick Motor Co., Flint, Mich. The roadster will sell for $985 and the touring cars for $1,020 f.o.b. factory.

The light six will carry 34 by 4-in. wheels and tires, instead of 32 by 4-in. as originally on this series. These prices and models will run through the entire 1916 season.

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Anderson Joins Master Carbureter

DETROIT, Feb. 21—Raymond M. Anderson, for five years chief engineer of the Stromberg Motor Devices Co., Chicago, and later research engineer of the J. I. Case T. M. Co., Racine, Wis., has joined the forces of the Master Carbureter Corp., this city, in the capacity of chief engineer.

Year's Exports Show Huge Increase—Total for 1916 $111,180,139

Great Britain Much the Heaviest Buyer—French Imports Large—Value of Canadian Imports Drops Though Number of Cars Increases

WASHINGTON, D. C., Feb. 21—The wonderful showing the United States has made in the exportation of automobiles during the last calendar year, as compared with the corresponding period of 1914, is shown in great detail in the figures issued to-day by the Department of Commerce. During the first mentioned period there were 22,082 commercial cars, valued at $59,834,246; 41,869 pleasure cars, valued at $35,045,492, and parts, not including engines and tires, valued at $16,300,401, shipped to various portions of the globe. Of course, a large proportion of these went to the warring countries in Europe.

For the same period of 1914, the figures show that 3430 commercial cars, valued at $8,985,756; 22,335 pleasure cars, valued at $19,521,708, and parts, not including engines and tires, valued at $5,664,104, were exported.

The exports for December last amounted to 1664 commercial cars, valued at $3,920,533; 3664 pleasure cars, valued at $2,710,758, and parts, not including engines and tires, valued at $1,791,805.

These are the figures for the same month of 1914: Commercial cars, 1279, valued at $3,387,729; pleasure cars, 1297, valued at $998,698; parts, not including engines and tires, $1,791,805.

The figures show that the United Kingdom was our best customer in both 1914 and 1915, the purchases of that country increasing from 6799 cars, valued at $6,891,511, in 1914, to 24,355 cars, valued at $35,055,097, in 1915. The December purchases increased from 850 cars, valued at $1,097,007, in 1914, to 1366 cars, valued at $1,969,048, in 1915.

France a Heavy Buyer

The war has likewise made France a good buyer of American cars, no less than 6304, valued at $15,922,313, being shipped there during the calendar year 1915, as against 2816 cars, valued at $5,099,452, imported in 1914. However, during the monthly period the shipments dropped from 969 cars, valued at $2,588,622, in December, 1914, to 423 cars, valued at $1,034,581, in December last.

We shipped 235 cars to Italy in 1914, the value of which was $160,058. In 1915 the number was 257 and the value $160,368. There were no shipments of automobiles to that country in December, 1914, but in December last 31 cars, valued at $15,494, were exported there.

Germany Cut Off

Our export trade in automobiles with Germany amounted to 1063 cars, valued at $799,552, in 1914, while in 1915 the number was only 4 and the value $2,800. There were no shipments to that country either in December, 1914, or in December last.

Under the heading, "Other Europe," a large increase in exports is indicated, no less than 8630 cars, valued at $22,330,357, being exported to those unnamed countries in 1915, as against 2785 cars, valued at $3,411,100, exported in 1914. During the December period these shipments increased from 27 cars, valued at $29,436, in 1914, to 608 cars, valued at $1,272,807, in 1915.

While more cars were shipped to Canada in 1915 than in 1914, the value was less. In 1914 the number was 4214 and the value $5,347,547, while in 1915 the number was 5796, while the value was $4,622,931. In December, 1914, 128 cars, valued at $189,466, were shipped across the border, while in December last the number was 348 and the value $259,110.

The West Indies and Bermuda are developing into good customers for American cars, the exports showing an increase from 646 cars, valued at $525,062, in 1914, to $1,877,680 in 1915. South America's imports of American cars likewise increased from 1149 cars, valued at $863,360, in 1914 to 3537 cars, valued at $1,862,326 in 1915.

The shipments of cars to British Oceania increased from 3475 cars, valued at $2,955,825, in 1914, to 4818 cars, valued at $4,075,299, while the exports to Asia and other Oceania increased from 1454 cars, valued at $1,425,656, to 4319 cars, valued at $6,278,813, during the same period.

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Ford Will Not Build at Wichita

KANSAS CITY, MO., Feb. 19—The Ford Motor Co. will not open an assembling plant at Wichita, Kan., as had been announced by the officials of the plant here. That decision came as the result of grants made to the Ford company by the city council that will permit further enlargement of the plant here. Between 7000 and 10,000 cars a year would have been assembled at Wichita if the plant had been built.

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Bimel Automobile Co. Now

SIDNEY OHIO, Feb. 21—The Bimel Buggy Co. has reincorporated as the Bimel Automobile Co., increasing its capital to $500,000. The buggy company was established in 1844. The present company took charge of the plant in this city in 1905.

The company has closed out its vehicle line and will concentrate on four- and six-cylinder cars. The four has been built during the last year for $585.

The latest development is a six-cylinder model with a motor, 3⅛ by 5 in., selling at $1,000 and up. This car will be ready for delivery by April 1.

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White Resigns from Lozier

NEW YORK CITY, Feb. 21—W. McK. White has resigned as sales manager of the Lozier Motor Co., Detroit, Mich., to form the company of Holden and White, 320 New York Life Building, Chicago. This company will act as general sales agent for four manufacturers of railroad supplies.

Exports of Cars, Trucks and Parts for December, 1915, and Calendar Year 1915

	December				Twelve Months Ending December			
	1914		1915		1914		1915	
	Number	Value	Number	Value	Number	Value	Number	Value
Motor Trucks	1,279	$3,387,729	1,664	$3,920,533	3,430	$8,985,756	22,082	$59,834,246
Passenger Cars	1,297	998,698	3,664	2,710,758	22,335	19,521,708	41,869	35,045,492
Parts (not including engines and tires)	....	456,014	....	1,791,805	.....	5,664,104	.....	16,300,401
BY COUNTRIES								
France	969	$2,588,622	423	$1,034,581	2,816	$5,099,452	6,304	$15,922,313
Germany	...	.....	....	.....	1,063	799,552	4	2,800
Italy	...	.....	31	15,494	235	160,058	257	160,368
United Kingdom	850	1,097,007	1,366	1,969,048	6,799	6,891,511	24,355	35,055,097
Other Europe	27	29,436	608	1,272,807	2,785	3,411,100	8,630	22,330,357
Canada	128	189,466	348	259,110	4,214	5,347,547	5,796	4,622,931
Mexico	7	9,660	63	58,065	88	111,344	172	160,467
West Indies and Bermuda	96	67,716	308	197,512	646	525,062	3,248	1,877,680
South America	86	40,476	751	363,748	1,149	863,360	3,537	1,862,326
British Oceania	285	222,975	392	371,323	3,475	2,955,825	4,818	4,075,299
Asia and other Oceania	92	115,792	583	762,921	1,454	1,425,656	4,319	6,278,813
Other Countries	36	25,277	455	326,682	1,041	917,097	2,511	2,081,287

S. A. E. Summer Trip Four Days on Lakes

Start Monday June 1—Noronic Again Chartered—Many New Members Admitted

DETROIT, Feb. 16—At the regular monthly meeting of the council of the Society of Automobile Engineers, the date of the annual summer session was arranged for and will be a four-day one beginning Monday, June 12, and ending Friday evening, June 16. The session will be held on the Great Lakes on the Steamer Noronic. Accommodation for over 500 members will be provided. There will be the usual professional sessions, work of Standards committees, and in addition the trip through Lake Huron and Georgian Bay will afford good opportunity for fishing, picknicking and various out-door sports.

The following applications for membership were approved: Charles R. Bissel, New York City; David W. Burke, Pittsburgh, Pa.; Andrew K. Brumbaugh, Ardmore, Pa.; Richard A. Leavell, Ames, Iowa; Harrold S. Edwards, Madison, Wis.; Frederick S. Elett, Elmira, N. Y.; Hugh M. Harris, Detroit, Mich.; Wm. A. McCosh, Indianapolis, Ind.; Nicolas G. Koutznetzoff, Petrograd, Russia; Eugene J. Ney, New York City; Glen Muffly, Chicago, Ill.; John F. Wade, Bristol, Conn.; W. J. Murray, Newark, N. J.; R. E. Plimpton, New York City; C. A. Obermaier, Harvey, Ill.; Ed. H. Rembe, Cleveland, O.; Westcott J. Smith, Detroit, Mich.; Alfred T. Sturt, New York City; O. P. Stehn, Cleveland, O.; Edw. W. Thurston, New York City; W. R. Vogeler, New York City, and R. L. Heberling, Philadelphia, Pa.

It was decided to move the office of Recorder of the Standards Committee from Detroit, where it has been located since its inception, six months ago, to New York where it will be located in the general offices of the society, 29 West Thirty-ninth Street.

The complete personnel of all of the members of the various Standards committees was passed upon and other routine work carried out.

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Testing Symposium for Metropolitan S. A. E.

NEW YORK CITY, Feb. 19—At the meeting of the Metropolitan Section of the Society of Automobile Engineers to be held in this city at the Automobile Club of America next Thursday, Feb. 24, at 8.15 p. m., there will be a symposium on motor testing. The topic will be introduced by Peter Payne Dean, M. A. I. E. E., with a paper entitled "Late Developments in Chassis and Motor Testing." Mr. C. F. Scott, engineer of the Sprague Electric Works, will discuss the topic and the laboratory side of the matter will be presented by Herbert Chase and Ferdinand Jehle of the engineering department of the Automobile Club of America.

This is the last meeting of the fiscal year of the Metropolitan Section and the report of the secretary and treasurer will also be presented. The incoming officers are Leonard Kebler, president of the Ward Leonard Electric Co., chairman; Harry Tipper, advertising manager the Texas Co., secretary, and H. G. McComb, engineer the General Vehicle Co., treasurer. The held-over officers will be R. McA. Lloyd, consulting engineer and J. Edward Schipper, technical editor THE AUTOMOBILE.

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Stewart Body Plant to Be Doubled

FLINT, MICH., Feb. 19—The plant of the W. F. Stewart Co., body manufacturer, will be practically doubled, according to an announcement made by president S. S. Stewart. The plant consists of half a dozen large factory buildings and some minor buildings. Additional floors will be put up on some, while in other instances additions to the buildings will be erected. A large number of dry kilns will be added, which will add at least 36,000 ft. of lumber per day to the plant's capacity. About 15,000 sq. ft. of floor space will be added to the sheet metal department.

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Lighter Acme Truck

DETROIT, MICH., Feb. 17—The Cadillac Auto Truck Co., Cadillac, Mich. will commence deliveries May 1 on its new 1-ton model. The new truck will resemble the 2-tonner in appearance and will be priced at $1,290. It has a 3½ by 5 Continental engine incorporated in a unit with a Warner dry-disk clutch and three-speed gearset, driving through a Timken worm-driven rear axle. It will have a Rayfield carbureter, Eisemann fixed-spark single ignition and a Pierce governor set at 22 m.p.h. maximum.

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Briscoe to Absorb Jackson Motor Shaft Co. July 1

JACKSON, MICH., Feb. 18—A deal has been closed between the Jackson Motor Shaft Co., and the Briscoe Motor Co., whereby the former concern will become part of the Briscoe organization beginning July 1, the Briscoe interests having purchased the plant and business.

The Jackson Motor Shaft Co. succeeded to the Hastings Motor Shaft Co. several years ago. There are now 180 men on the company's pay roll.

Leight C. Bloomfield, who has been with the company since it succeeded the Hastings company, will remain as general manager.

Elgin Plans Week of Racing

Promoters Hope for Vanderbilt, Grand Prize and Two Elgin Classics

ELGIN, ILL., Feb. 19—Elgin has been given the opportunity of becoming the exclusive road racing center of the world for 1916. The four highway classics of America, the Vanderbilt Cup, Grand Prize, Elgin National trophy and the Chicago Automobile Club trophy, may be run over the Elgin course next August. Promoters of the Elgin road races, the Elgin Motor Club and the Chicago Automobile Club, have determined to land the speed carnival for Elgin. Their action followed the announcement of the Motor Cups Holding corporation, that no sanctions of the Vanderbilt and Grand Prize will be issued for speedways. To secure the classic it will be necessary for Elgin to raise $15,000. This will probably be done by selling 1500 tickets at $10 each, entitling the holder to admittance to all four events, Elgin guaranteeing that one-half will be sold.

Want 8-Day Meet

Although Elgin enthusiasts believe that the Classic could be held here in four days, Chicago promoters favor eight days, commencing on Saturday and ending on the following Saturday. The plan of the Chicago enthusiasts is to have an entire week of racing, opening with the Vanderbilt Cup and closing with the Grand Prize. The former will be a 300-mile event and the latter 500 miles. It is proposed that the contests for the Chicago Cup and Elgin National trophy, be staged on Tuesday and Thursday, respectively and the distance of each be cut to 200 miles. The prize money is to be distributed as follows: $3,000 for first; $1,500 for second; $900 for third and $600 for fourth. This is $1,000 less than was offered for the Grand Prize and Vanderbilt Cup at San Francisco last year but double the amount hung for either of the Elgin events last year. The cost for promoting the classics would be about $40,000 or an average of $10,000 for each.

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Premier Engineers in Detroit

DETROIT, MICH., Feb. 21—The Premier Motor Corp., Indianapolis, will maintain part of its engineering department in Detroit, where the designing of the new Premier models is to be made. Quarters have been opened in the Kresge Building and E. G. Gunn and C. S. Crawford, who, with J. L. Yarcan form the engineering board of the corporation, will be located in Detroit most of their time.

Colorado Winter Automobile Sales Are Double Those of a Year Ago

Prospects for 1916 Sales are Regarded Excellent by Dealers Who Anticipate Demands for at Least 12,000 Cars—Road Development Will Help

DENVER, COL., Feb. 18—Denver's automobile row winter business averages about double that of last year, and its prospects are declared the best yet. Figured on the basis of the last three months, sales increases ranging from 30 to 500 per cent over the corresponding period a year ago are reported by established dealers, while a doubling or even trebling of last winter's business is shown in many cases.

Greatest Growth in East

Naturally, this substantial showing in growth of sales is most pronounced in the eastern half of Colorado, where moderate snowfall and pleasant weather in general have encouraged winter motoring and winter buying. But the gratifying prospects for total 1916 business are in evidence throughout the State, and also through Wyoming, Utah, New Mexico and all other Rocky Mountain territory supplied by Denver distributors. Sub-dealers throughout the district are backing up their claims concerning the favorable outlook by placing orders for cars in goodly numbers and urging prompt delivery to take care of demands likely to come in a rush with the first settled weather for spring motoring.

Colorado's State license law for motor vehicles went into effect in July, 1913, and every year has shown such a surprising increase in car registration that the Secretary of State has found it necessary to purchase several hundred more license tags than originally ordered upon an estimate allowing for a liberal increase. The 1914 record exceeded that of 1913 by nearly 5000 cars, and 1915 showed an additional increase of nearly 10,000. Colorado dealers are unanimous in supporting Secretary of State Ramer's estimate of another 12,000-car growth in 1916, while many of them declare that 20,000 would be a safe estimate. The exact figures for the three years under the State registration law are as follows:

1913	13,624
1914	18,433
1915	28,254

Twenty-six Inhabitants per Car

This is regarded as an exceptionally good showing for a State having a total population of only a little over 800,000—scarcely a third as many people as are claimed by the City of Chicago alone. Besides, a large portion of the State is mountainous, motor roads are hard to build, and in some sections it would be necessary to travel many miles to find enough citizens to fill a seven-passenger car.

Already three established transcontinental highways cross the main range of the Rockies in Colorado, and three more roads to connect important scenic and industrial sections will be completed across the Continental Divide within the next year or two, one of these traversing almost the entire length of the State. State Highway Commissioner Ehrhart says that more than $2,000,000 will be used for road improvements this year from the State and county funds.

The mining industry of the State shows a gradual growth, which is considered far better than the frequent "booms" of those days when fortunes were made in a day by a rich strike of high-grade ore—and frequently lost in a night through attempts to double them by tackling the other fellow's gambling game. And yet even the last few months have developed a near approach to a real "boom" in Boulder County's world-famed tungsten district 50 miles from Denver, through new strikes of remarkably rich ore, combined with the rapid jumps in the price of tungsten due to the demand for this product for automobile and tool steel purposes.

Adds New Industries

While thinly settled, mountainous, and not extensively an agricultural State, Colorado has also been making rapid progress in this direction during the last few years, and has already won recognition in national markets for fruits, sugar beets, potatoes, alfalfa and other crops. The State has been especially fortunate the last two years in having an abundance of irrigation water in all districts, along with an unusual amount of rainfall sufficient to insure favorable crop returns in the dry-farming sections. Deep plowing and other modern, scientific methods are also making for rapid development of this non-irrigated territory, where thousands of acres still remain to be settled.

An example of Colorado's good fortune in farm returns last year was the excellent potato crop, which brought an unusually good price on account of a marked shortage in other parts of the country.

Stock raising is still a flourishing industry in Colorado and adjacent States, with prevailing high prices, and the last two years have afforded favorable conditions for both summer grazing and winter feeding.

Fully one-half of Colorado's more than 28,000 cars now belong in cities and towns, nearly a third of the total being in Denver alone; but the proportion owned by farmers and stockmen is rapidly increasing, and this class of trade promises to make a big showing within the next decade. Many of these people bought cars at the time of the fall show held by the Automobile Trades' Association of Colorado last October, hundreds more studied new models at that exhibit, and the stimulus given the motor industry throughout this territory by that event is still being felt.

The use of tractors in this district has only begun, and the tractor business is still being handled by implement dealers. Where tractors can be afforded, however, and are being tried out in the cultivation of a big acreage, they are a big success. The tractor method is particularly valuable for deep plowing in the dry-farming sections, where the farmers are able to make the necessary outlay to buy the required equipment.

National Parks an Asset

Another aid to the automobile industry in this region is the national part movement, with the recent establishing of the Rocky Mountain National Park, a wild, scenic tract of 360 square miles of mountain playground 100 miles northwest of Denver, the opening of the Yellowstone National Park to motor cars, the proposed government road connecting these and other national parks in the West, and other enterprises for developing scenic resources, building better and more attractive highways and in general promoting motor travel. One result of this increased travel is the attracting of more and more capital from the outside to help develop the resources of the mountain States, which, in turn, builds up general business and broadens the smile of the dealer.

To take care of their growing business in the Rocky Mountain district, the Ford Co. built an assembling plant in Denver two years ago to supply Colorado, Wyoming, Utah and New Mexico. A practical indication of how the business of this one concern has increased here since that time is furnished by the fact that ground will be broken within a week for the erection of an additional building to double the new plant's present capacity of between sixty and seventy cars a day. This will also mean a considerable increase in the present force of 300 men employed, and will thus contribute a substantial increase to general business in Denver.

During the last three months, the Ford increase over last year has been about 300 per cent here in Denver, and 200 per cent throughout the rest of the territory.

The Hudson, Dodge, Oakland, Dort, King, Grant, Saxon, Buick, Chevrolet, Overland, Studebaker, Metz, Maxwell, Haynes, Pierce, Packard, Paige, Abbott, Chalmers, Hupmobile and other established makes also show sales increases running to 100 and 200 per cent over a year ago, while the Scripps-Booth, Enger, H. A. L. and some other new makes in the territory are getting a gratifying start. The tire and accessory houses likewise report a substantial growth in business throughout the district.

The record sales increase found, where an established and extensive business is concerned, is the 500 per cent gain reported by W. W. Barnett, Oldsmobile distributor and president of the Automobiles Trades Association. This trades body, incidentally, by standardizing many features of the industry, introducing improved business methods, promoting harmony and co-operation among the dealers and otherwise building up the best and most practical interests of the motor industry, has accomplished a great deal in an organized way toward helping along this favorable showing in sales.

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Koenig & Luhrs Wagon Co. Builds Truck Chassis

QUINCY, ILL., Feb. 19—The Koenig & Luhrs Wagon Co., this city, has begun the construction of motor truck chassis, the first one being completed on the fifteenth anniversary of the founding of the company. Before undertaking its new line the company installed the necessary machinery and employed a number of experienced mechanics to look after the new department. With the rapid substitution of motor vehicles for horses, the company may extend its activities to other fields of the industry.

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Wisconsin Car Registrations Gain 100 per Cent on January, 1915

MADISON, WIS., Feb. 19—An increase of more than 100 per cent in the number of licenses issued to private owners of Wisconsin is noted for the month of January, 1916, compared with the corresponding period of 1915. Up to the end of January 28,500 licenses were issued, against 13,100 in January, a year ago. On February 15, the number of licenses issued 32,500, which figure maintains the 100 per cent increase. Applications are coming into the Secretary of State's office at Madison at the rate of 275 a day, and as the season advances it is expected that more than 500 requests will be filed daily. The 1915 registration of private owners was 79,791 and it is figured that the total for 1916 will be at least 110,000.

Omaha Expects Many Dealers

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90 Per Cent of Those in the Territory to Attend Record Show

OMAHA, NEB., Feb. 21—Ten times greater than the first Omaha show of 1906, the eleventh annual exhibition, held in the municipal auditorium, displays over 200 cars, every available inch of space on the main floor and in the basement being taken. More than 90 per cent of the dealers in the Omaha territory are expected to attend the show and even a large portion of the remaining 10 per cent will probably drop in for at least a day during the week. Over sixty dealers are represented at the show.

There will be "days" for the ladies, the visitors from out of town, the farmers, and all the rest, of course, and extensive preparations have been made to make each of these an occasion in itself. For instance, on Farmers' Day there will be on hand a special corps of demonstrators from the factories who will supply any information which may be desired; there will be a special exhibition of tractors, as a direct recognition of the importance of the agricultural interests in the show, and special music designed will be furnished. And for every other day a similar provision has been made.

The decorations form a Japanese garden setting, the colors being orange, black and white lending themselves well to blend with the glow of the thousands of electric bulbs.

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"Velie" is New Southern Town

VELIE, LA., Feb. 17—Many Velie cars are owned in the southern district, and as a result the name is well and favorably known. A community directly north of Shreveport, La., has assumed such importance that it was entitled to the post-office privileges.

Many meaningless titles were suggested and finally an enthusiastic Velie owner suggested the town be called "Velie." The name was indorsed by several other Velie owners present and adopted unanimously. Uncle Sam promptly approved the petition and Velie, La., is now an established fact.

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Fisk Sales Total $14,500,000

CHICOPEE FALLS, MASS., Feb. 17—Sales for the fiscal year of $14,500,000 with net profits of $1,791,579 were reported at the annual meeting of the Fisk Rubber Co., held here yesterday.

On account of insufficient time action on the authorization of additional capital stock was not taken up and the meeting was adjourned until March 8 for action on this question. The present capitalization is made up of $5,000,000 first preferred, $2,000,000 second preferred, and $8,000,000 common.

The regular quarterly dividends of 1¾ per cent on the preferred stock, payable May 1 and on the second preferred stock, payable June 15 were declared.

The officers and directors were re-elected, as follows: President, H. T. Dunn; vice-president, E. H. Broadwell; chief engineer, John Ke rns; sales manager, J. D. Anderson.

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Garford Truck Officers Re-elected—Report Prosperous Year

LIMA, OHIO, Feb. 19—The annual statement of the Garford Motor Truck Co., read at the annual meeting of the stockholders and directors, showed that the year just closed has been the most prosperous one in the history of the concern.

All the stockholders expressed themselves as well pleased with the report and voted to re-elect the same staff of officers and directors for the coming year. E. A. Williams will again serve as president and general manager; J. M. Carver will be secretary.

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$800,000 Company to Take Over Delco House-Lighting Industry

DAYTON, OHIO, Feb. 19—The Domestic Engineering Co., incorporated with a capital of $800,000, has been formed to take over the Delco domestic light industry of the Dayton Engineering Laboratories Co., this city. The incorporators of the new concern, which will have practically the same organization as the Delco, are Edward A. Deeds, R. H. Grant and R. D. Funkhouser.

Mr. Deeds is one of the men who are backing the project to make a model community and industrial center south of Oakwood, approximately 3500 acres of land either having been purchased outright or secured by option for that purpose. Adam Schantz and C. F. Kettering are associated with him in this enterprise, and it has been announced that the new plant of the Delco, to be devoted to the manufacture of electric light outfits for farm and rural communities, will be built in that section.

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Champion Spark Plug Gets Injunction

TOLEDO, OHIO, Feb. 20—The Champion Spark Plug has secured a permanent injunction against the Keystone Auto Supply Co., restraining the latter concern from manufacturing or selling an imitation of the Champion X spark plug for Ford cars. The decision was handed down by the District Court of western New York.

State of Iowa Now Has One Automobile to Each Fifteen Inhabitants

Farmers Estimated to Be Worth $1,000,000,000—This Means $100,000,000 Available for Automobile Buying—2587 Dealers in State

DES MOINES, Feb. 20—The Des Moines automobile show, which was held this week, is a show of promise. The dealers from all parts of the States which are served by Des Moines are looking for an increase, and not a decrease in 1916 business. The big distinguishing characteristic of the State is her always present market for her products, and this is because those products are foodstuffs.

Iowa now owns one car to every fifteen people, men, women and children. Line the population up in a row and every fifteenth person owns a car. In Buena Vista county there is a car to every person in nine, and by the end of 1916 the figure will be still more startling.

Products Worth a Billion

The per capita wealth of the United States is $1,965. In Iowa it is $3,345. The State has money; and it made a lot in 1915, and, furthermore, the Iowa farmer, with his modern lighting plant, plumbing and other improvements is not averse to buying a car if his year's business warrants it.

With products estimated at $1,000,000,000, the Iowa farmer should be a good car buyer. Of course, a large percentage of the billion will go for living expenses and operation of the farms, but if only 10 per cent of it is used for cars it means $100,000,000, and this means 100,000 cars averaging $1,000.

It probably will not be 100,000, because the normal progress of business is not subject to such sudden jumps. The following table shows the gains and percentage of gains during the past few years, and these must be taken into consideration in estimating for the coming year.

Year	Cars Owned	Cars Bought	Percentage of Gain
1911	27,998	.....	..
1912	44,188	16,190	57
1913	70,068	25,880	58
1914	106,087	36,019	51
1915	145,076	38,989	36

The decrease in gain from 51 to 36 per cent for 1915 may be attributed to weather conditions. A normal gain, estimated on the three preceding years, is about 50 per cent. A 50 per cent gain would be approximately 75,000 cars for 1916. A gain of one-third would be 50,000 cars. With the possible buying power and the percentages of gain of preceding years as a basis, it is safe to estimate that Iowa will buy 75,000 cars in 1916.

There are in the State 2587 dealers. This means thirty cars to each dealer, and there are some who will sell many more than that. If each sale averages a profit of $200, which is low, it means a profit of $6,000 for each dealer. It means $15,000,000 in profits for the dealers of the State.

The Wealth of the State

Corn and hogs are a big product in Iowa. They have said that in Iowa corn is king; nobody has placed the hog on a throne, but if corn is king the hog is queen. The co-relation of these two products has helped Iowa through her present year. An early frost and rain hurt the corn; it produced what is called "soft corn," a corn which does not mature and harden in the ear. This might seem to be waste—but it isn't. It is excellent hog fodder if rightly fed. When the weather man said: "I'll spoil your corn," the Iowa farmer answered: "All right, I'll take my profit from pork." When Iowa is blocked at one point she pushes through at another. She won't be stopped.

Diversity of Products

That is why a 1915 crop of corn valued at only $154,530,000 is not a setback when compared with a 1914 crop valued at $214,183,000. It looks like a loss of 28 per cent—but it isn't. May and July corn are to-day selling within a few cents of the price of a year ago. Pork products are about $1 lower.

Iowa knows her salvation is in a diversity of products. For that reason the State is promoting agricultural study and research. Popcorn is becoming an important crop; 30,000,000 lb., valued at $625,000, were yielded in 1915. The farmers are scientific. The national government sent a man on a long pilgrimage to learn about popcorn, and it wasn't until he reached Iowa that he found what he wanted to know, which was what puts the pop in popcorn. The pop of perfection is caused by 12½ per cent of moisture in the kernel. And Iowa knows how to put it in, take it out and put it back in again.

Corn is a big crop, of course; so also are oats, wheat, potatoes, hay, barley, apples—which are a newcomer—and then there are the hogs, the beef cattle, the dairy products and other lesser food products. Iow'a specialty is feeding people.

It is true that the total value of the corn, oats, wheat, hay and barley crops are less by 13 per cent, and that the value of the live stock on hand Jan. 1 is 2 per cent less than a year ago, but it is also true that bank deposits increased about $20,000,000 during the year. Some of this money would have bought cars in 1915 had there been cars to buy, but car shortages were the big trouble of the dealers last year. There was plenty of money, plenty of orders—but no cars. Therefore, part of this banked $20,000,000 is still waiting to buy cars, and added to it is the natural production of the year.

As was stated previously, much of the poor corn was used to feed swine and cattle. Beef raising is becoming more and more a strictly Iowa industry. In the past it has been the custom of the Iowa farmer to go into the Omaha market and buy what are called "feeders," cattle which are bought for fattening during the winter and sold about now and during the spring. But the Iowa farmer has had to pay a higher price this

Iowa Farming Statistics

	Amount		Value	
	1914	1915	1914	1915
Corn (bu.)	363,689,600	303,000,000	$214,183,000	$154,530,000
Oats (bu.)	172,696,000	198,000,000	67,650,000	63,360,000
Wheat (bu.)	15,427,280	15,557,000	14,463,000	13,535,000
Barley (bu.)	11,423,310	.....	5,397,053	5,362,000
Potatoes (bu.)	9,540,200	15,540,000	5,533,316	8,392,000
Hay (tons)	5,094,650	6,692,000	52,769,626	66,920,000
Total			$359,995,995	$312,099,000

Decrease of $47,896,995, or 13 per cent.

	Number on Farms Jan. 1		Value Per Head		Total Value Jan. 1	
	1916	1915	1916	1915	1916	1915
Horses	1,580,000	1,600,000	$105.00	$105.00	$165,900,000	$168,000,000
Mules	61,000	58,000	110.00	111.00	6,710,000	6,438,000
Milk cows	1,390,000	1,377,000	58.50	57.00	79,249,500	78,489,000
Other cattle	2,740,000	2,683,000	38.30	37.50	102,795,000	100,612,000
Swine	9,070,000	8,720,000	9.30	11.00	84,351,000	95,920,000
Sheep	1,270,000	1,249,000	6.30	5.50	8,001,000	6,994,000
Total value Jan. 1					$447,006,500	$456,453,000

Decrease of $9,446,500, or 2 per cent.

past year for feeders and anyway he is raising his own feeders. Swine, of course, are an Iowa product from pig infancy up.

Milk cows are not sold, but the State's dairy products are sold all over the world, and this industry is spreading. Horses have been and are being sold for war purposes, and the mule industry is gaining a footing. Some of the $20,000,000 that was banked in 1915 came from last spring's sales of stock, and during the next few months there will be a big income from feeders and swine.

One progressive step made last year in Iowa was vaccination against hog cholera. The results were invaluable. There was little of this trouble. What the coming months may mean in stock revenues is indicated by the value of the live stock on hand Jan. 1.

Bank Deposits High

Having cited production figures which show a lesser value for 1915 than for the preceding year, it is only fair to cite at the same time the bank deposits. They were, as given in a report of the banking department, $329,633,636.12 at the call of Sept. 11, 1915, and this exceeded the call of Nov. 4, 1914, but ten months previous, by $21,522,719.16, a gain of 6 per cent. Of this total deposits, 70 per cent is in savings banks.

Wants New Foodstuff

Iowa is all the time looking around for a new foodstuff to add to her resources. There is now on an agitation for apples. The Iowan believes the old State will grow almost anything—and he seems to be nearly right. And the more crops he can grow the smaller and smaller becomes the chance of breaking the record of "many misfortunes, but never a failure."

Farmers and Boosters

The Iowan is regarded as a farmer. It is true, he does this for a living, but his next biggest occupation is boosting. In not more than 60 seconds after an Easterner wandered into the automobile show the other evening he had been told that Iowa is first in value of farm products, value of live stock, value of farm property per farm, in increased valuation from 1900 to 1910, in percentage of improved farm land, in percentage of area in farms, in number of automobiles per capita, in value of horses, in value of cattle, in value of hogs, in number of poultry, in value of egg production, in tonnage of forage crops, in production of corn, in production of oats, in production of grass seed and a few other things too numerous to mention here—but the Iowan mentions them everywhere.

There is no question but what Iowa is a great State. If in doubt just mention the subject in the neighborhood of an Iowa man and hear him admit it.

How Pouring Gas Creates Electricity

Moline Co. Finds Fires Can Be Caused Even When No Chamois is Used

MOLINE, ILL., Feb. 21—In January, the Moline Automobile Co., East Moline, Ill., manufacturer of the Moline Knight engines and automobiles, had two fires caused by the ignition of gasoline when being drawn from one of their filling stations. The Moline Automobile Co.'s supply tank is located at some distance from filling stations. The gasoline is pumped through a 1½-in. iron pipe by means of an electrically-operated pump controlled at each of the filling stations. The two fires both occurred at the service department's station and within about a week of each other. This filling station is at the end of a long pipe line which leads through a duct beside an asbestos covered steam pipe. It had been noticed that the gasoline, especially that first to be drawn in the morning was very warm and, therefore, gasified readily. In both of these fires, it was noted that the gasoline ignited when the can had about four gallons of gasoline in it and before the control switch for pump was pulled.

Switch Spark Eliminated

As the control switch for the electric motor was situated near the drawing faucet, it was first assumed that possibly the explosion and fire occurred by the fumes catching from a spark due to bad switch connection. Therefore, immediate steps were taken to remove the gasoline pipe from the steam duct so that the gasoline would not be heated.

In about another week there was a similar fire, although not so much damage due to the presence of mind of the operator to shut off the gasoline. This time the explosion occurred after about 3½ gal. of gasoline was drawn. The man drawing the gasoline distinctly heard the snap and the explosion.

Investigation showed that the former theory of the fire was in error. It is believed that the fire was caused by static electricity jumping from the funnel of the can to the faucet. A 5-gal. can with a funnel but no chamois skin was used. The funnel rested in the neck of can and came in direct contact with the can. The can rested on a wooden box which formed a complete electrical insulator for the can. The height of the funnel was about the same as the faucet. Thus by movement of the can, the air gap between the funnel and the faucet could be changed. We found that static electricity is generated by the flowing of gasoline into the can. When there was sufficient static electricity generated in the surface of the can, making its potential great enough above that of the faucet, it would break down the air gap and jump from the funnel to the faucet. This would set fire to the gasoline.

Experiments showed that a spark could be drawn from can after it was partly filled with gasoline, providing it was left undisturbed on the wooden box. This spark could either be drawn by a wire direct connected to the piping system and therefore grounded, or even through a man's hand who was standing on the floor as he approached with his hand the surface of the can to about the distance of ¾ in. This spark is similar to one secured under certain atmospheric conditions by scuffing along a heavy carpet and touching some other person or conducting article.

Principle an Old One

This principle was discovered in the early days of the discovery of electricity and we find reference to an apparatus known as "Lord Kelvin's water dropping apparatus." We have learned since our fires that there have been similar cases of fires from apparently the same causes. In a recent publication of one of the trade papers there is published an article in which the author claims that the fire resulted from the gasoline being strained through a chamois, which generated the static electricity on the can or funnel. The experience of the fires at the Moline Automobile Co. shows that the chamois is not necessary, and that providing your can is well insulated and nothing touching it but electrical insulating material a charge of electricity will be stored on the surface of the can as gasoline is being poured into it.

Hang Can on Faucet

The reason for not having trouble at the other filling station is thought to be due to the fact that the cans are either hung on the faucet by the handle or rest on some metal grounded support.

The Moline company has installed at this filling station a metal rest instead of the wooden box. This metal is perfectly grounded to all piping.

The Moline Automobile Co. therefore wishes to warn all filling stations to be sure that the charge collecting on the can is properly disposed of and not allowed to build up. The can should be resting on some conducting metal properly grounded. If metal pipe is used, then pipe and can should be metallically connected in some way.

It is also to be noted that under this theory the can, while resting on some insulating material might be filled and carried by someone wearing gloves, which would keep the can still insulated and would allow the can to discharge static electricity to car tank or other metal and possibly when this spark is discharged, to set fire to the can of gasoline.

Security Prices Steady

Chevrolet and G. M. Stocks Higher—Chalmers Common Rises 20 Points

NEW YORK CITY, Feb. 21—Notwithstanding the statement of C. W. Nash, president of the General Motors Co., that the stockholders of the company could not expect it to make as great earnings for the remainder of the fiscal year as were made from July, 1915, to Jan. 31, 1916, a number of the automobile and accessory issues showed substantial gains for the week. Some of the automobile securities, however, have been extremely weak. The statement caused a little selling of Maxwell Motors and Studebaker, but nothing of any importance. These two issues, together with Willys-Overland, were quoting considerably lower than in the previous week. However, the market, notwithstanding these declines, was on the whole, about 20 points higher than last week.

Chalmers featured the securities with a 20-point rise, closing on Saturday at 130. General Motors, on the strength of its recent financial statement, managed to hold above 475, closing on Saturday 2 points above that mark. Chevrolet also held strong at 134 with a gain of 4 points. It is stated that this company should show $6,000,000 earnings this year.

A few of the tire issues last week showed strength. Firestone common went up 5 points, closing at 735, and Goodrich common went up ⅛ point. This company announced its 1915 earnings last week, showing a surplus of 17 per cent on its common stock, and paid out $600,000 as a dividend on its common stock. This is 1 per cent on the issue of $60,000,000 of the common stock. Two quarterly dividends on the $28,000,000 preferred stock have been declared at the rate of 1¾ per cent quarterly, payable April 1. Miller Rubber common also showed a gain, closing at 275, just 2 points higher.

The drops this week were for the most part in the automobile stocks. Studebaker common, which has been one of the chief speculative stocks, closed on Saturday at 146 at a loss of 7 points; Maxwell common, first and second preferred, dropped 4¼, 1 and 1¼ points, respectively, and Willys-Overland common, which has shown considerable strength during the past few weeks, declined 13 points, closing on Saturday at 208.

The Detroit issues were featured last week with 100-point rise, after a 60-point rise the previous week. Chalmers common rose 16 points and Packard common 5 points.

The stock of the Auto Body Co., Lansing, Mich., will be listed upon the Detroit Stock Exchange. The capital stock of the company is $500,000. During 1915 the company paid its stockholders a 15 per cent cash dividend and 75 per cent in stock dividends.

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Edmonds & Fulton Is New Firm

DETROIT, MICH., Feb. 21—Edmonds & Fulton, is a new firm formed in Detroit to act as manufacturers' representatives. J. D. Edmonds and H. S. Fulton are the partners who have taken quarters in the Majestic Building. The Perry-Fay Mfg. Co., Elyria, O., and the Pittsburgh Screw & Bolt Co., are among the concerns represented by the new firm.

American Motors Corp. Organized

$1,250,000 Co. To Build Cars—Louis Chevrolet Chief Engineer

NEW YORK CITY, Feb. 21—Louis Chevrolet and a group of Eastern business men, including W. H. Hoople, president of the Interstate Electric Corp.; J. C. Spiers, formerly general manager of the Autocar Co. and factory manager of the Locomobile, Mercer, S. G. V. and Standard Roller Bearing companies, and G. F. Baright, formerly advertising manager of the Prudential Life Insurance Co., Newark, N. J., have completed the organization of the American Motors Corp., which is to engage in the manufacture of automobiles on a large scale.

The company is capitalized at $1,250,000. Its first output will consist of a moderate-priced car. Louis Chevrolet, vice-president and chief engineer of the company, is also president of the Frontenac Motor Co., Detroit, builder of racing cars of his design.

The main plant of the new company will be located in the East in order to gain ready access to this market.

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Copper and Aluminum Prices Up

NEW YORK CITY, Feb. 21—Materials prices last week were generally steady, most of the prices remaining unchanged. Both copper and aluminum prices advanced while Up-River Para rubber declined 3 cents a pound to 76. Electrolytic and lake copper are quoting at an

Automobile Securities Quotations on the New York and Detroit Exchanges

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Ajax Rubber Co. (new)	..	..	71	72	+ ½
Aluminum Castings pfd	95	100	..	..	..
J. I. Case pfd	..	83	85	87½	+1
Chalmers Motor Co. com	..	93	130	138	+20
Chalmers Motor Co. pfd	..	94	99	101	..
Chevrolet Motor Co	..	..	134	135	+4
Electric Storage Battery Co	48	49	64	66	—1
Firestone Tire & Rubber Co. com	375	380	735	..	+5
Firestone Tire & Rubber Co. pfd	108	109½	112	..	..
General Motors Co. com	88	90	477	479	+2
General Motors Co. pfd	94	95	114	115	+1
B. F. Goodrich Co. com	30½	31¼	72⅜	73⅜	+⅛
B. F. Goodrich Co. pfd	96¼	98½	113	114	..
Goodyear Tire & Rubber Co. com	192	193½	342	347	+2
Goodyear Tire & Rubber Co. pfd	101½	102½	116	117½	..
Gray & Davis, Inc., pfd	..	..	98	102	..
International Motor Co. com	..	..	22	25	..
International Motor Co. pfd	..	..	35	40	..
Kelly-Springfield Tire Co. com	108	108½	280	300	..
Kelly-Springfield Tire Co. com. (new)	..	..	71	72	..
Kelly-Springfield Tire Co. 1st pfd	82½	93½	95	97	..
Kelly-Springfield Tire Co. 2d pfd	120	127	71	72	+2
Maxwell Motor Co. com	23⅜	24	65¼	66¼	—4¼
Maxwell Motor Co. 1st pfd	60	60½	86	88	—1
Maxwell Motor Co. 2d pfd	24¼	24¾	49¾	50½	—1¼
Miller Rubber Co. com	150	156	275	278	+2
Miller Rubber Co. pfd	101	103	113½	116	—1¾
New Departure Mfg. Co. com	118	123	174	177	..
New Departure Mfg. Co. pfd	105½	106½	111	..	+1
Packard Motor Car Co. com	..	99	170	180	+5
Packard Motor Car Co. pfd	95	..	102	†104	..
Paige-Detroit Motor Car	..	..	665	700	..
Peerless Motor & Truck Corp	..	..	26	27	— ½
Portage Rubber Co. com	34	36	65	70	..
Portage Rubber Co. pfd	85	95	107	109	..
Regal Motor Co. pfd	..	..	13	16	+1
*Reo Motor Truck Co	11	12	27¼	28	+ ¼
*Reo Motor Car Co	25¼	26¼	34	34½	— ½
Splitdorf Electric Co. pfd	..	..	..	..	..
Stewart-Warner Speed. Corp. com	48	49½	86½	87½	— ½
Stewart-Warner Speed. Corp. pfd	101	103	108	..	..
Studebaker Corp. com	44¼	44⅝	146	147	—7
Studebaker Corp. pfd	92¾	95	109	112	—2½
Swinehart Tire & Rubber Co	71	73½	87½	90	— ½
Texas Co.	132	133	207½	208¾	—5½
U. S. Rubber Co. com	54	54¼	51¾	52¾	— ¾
U. S. Rubber Co. pfd	101½	103	106	108	— ½
Vacuum Oil Co	188	192	228	235	+11
White Motor Co. (new)	..	..	49¾	51¼	— ¾
Willys-Overland Co. com	92	93	208	212	—13
Willys-Overland Co. pfd	94	94¼	104	108	..

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Chalmers Motor Co. com	..	93	141	147	+16
Chalmers Motor Co. pfd	91	94	..	101	+2
Continental Motor Co. com	175	200	450	500	+100
Continental Motor Co. pfd	75	..	91	..	..
Ford Motor Co. of Canada	500	..	..	410	—5
General Motors Co. com	88	92	450	480	—10
General Motors Co. pfd	92	95	112	115	..
Maxwell Motor Co. com	22½	24	65	68	—3½
Maxwell Motor Co. 1st pfd	58	60	86	88½	—1¼
Maxwell Motor Co. 2d pfd	23	25	50	52½	—2¼
Packard Motor Car Co. com	..	99	165	176	+5
Packard Motor Car Co. pfd	95	..	..	104½	..
Paige-Detroit Motor Car Co	..	..	665	700	..
*Reo Motor Car Co	25¾	26½	33¾	34¾	— ¼
*Reo Motor Truck Co	11	12	..	27¾	— ¼
Studebaker Corp. com	43½	44½	146	149	—7
Studebaker Corp. pfd	91	95	108	113	—1

INACTIVE STOCKS

*Atlas Drop Forge Co	..	25	32⅜	..	— ⅛
Kelsey Wheel Co	195	215	435	..	—30
*W. K. Prudden Co	18¾	19¾	..	33	— ½
Regal Motor Car Co. pfd	..	25	13	16	+ ½

*Par value $10. †And accrued dividend.

advance of 1 cent a pound over last week's quotations, which were 27½ cents for each of the two grades. Aluminum has gone up to 57 cents a pound at an advance of 1 cent. The metals have been the feature of the materials market. The demand has been very large, notwithstanding the high prices.

Rubber prices, which created much comment recently, have again reached something like normal. Fine Up-River Para, which fluctuated throughout the week, closed on Saturday at 76. The Ceylon, First Latex Crepe grade, saw a gradual rise of about a cent a pound per day, closing on Saturday at 91, just 2 points higher. The demand for rubber is active, but manufacturers do not show much disposition to anticipate requirements in making purchases of crude material.

Prices in the oils and lubricants were constant. Linseed oil advanced 1 cent. The rest of the prices were unchanged. Gasoline is still quoting at 23 cents with rumors of a further advance in the near future.

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Rayfield Motor Car Co. Defunct

CHRISMAN, ILL., Feb. 19—The Rayfield Motor Car Co., this city, is now defunct. The entire belongings were sold at auction under decree of the Federal Court. The machinery and office fixtures were distributed among St. Louis, Indianapolis and Chrisman buyers, the amount realized aggregating $14,000. F. K. Thayer, of Chrisman, purchased the building for $2,500. No bids were received when the plant was put up as a whole and it was necessary to sell each portion separately.

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Cornell, Speaker at Indiana Section of S. A. E.

INDIANAPOLIS, IND., Feb. 19—The February meeting of the Indiana Section of the Society of Automobile Engineers will be held at the Claypool Hotel, Friday, Feb. 25 at 8 p. m. The topic is "Anticipating Complaints" and the author of the paper is F. A. Cornell, formerly head of the service department of the Willys-Overland Co.

Atlas Ball Co. to Expand

New Plant Will Quadruple Production—To Be Finished in 3 Months

PHILADELPHIA, PA., Feb. 16—In about three months the Atlas Ball Co. will move into its new plant which will have a capacity four times as great as the present factory. The growth of this concern is indicative of the tendency toward buying parts in this country which manufacturers formerly believed could not be made as well here as abroad. The European war has afforded an opportunity for many of the domestic manufacturers to show that their products can readily take the place of the European and the Atlas Ball Co. is a concrete example of this, as the business for 1915 is 95 per cent greater than it was in 1914 and the plant is at present working 22 out of 24 hr. The rate of manufacture has grown to such an extent that the company is now turning out in one month as many balls as were made in the entire year 1911. The balls made by this concern range in size from 1/16-in. up to 2½-in. and are used by very many of the ball bearing manufacturers in the country.

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Fletcher Resigns from Stewart Motor

BUFFALO, N. Y., Feb. 17—H. R. Fletcher, for several years past connected with the Stewart Motor Corp., Buffalo, N. Y., as sales manager, has resigned to become a director and manager of the Triangle Motor Sales Co., 1872 Broadway, New York City, this company having been organized as the New York City selling agency for Stewart delivery trucks.

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Many Dealers Driving Home New Cars

DETROIT, MICH., Feb. 18—Although this is not yet exactly drive-away weather, a number of such events have taken place from local and other Michigan automobile factories. They were, however, planned simply as a means of securing cars quickly or rather quicker than it would be possible to get them when shipped by rail. It is all due to the freight car shortage situation.

While in Toledo a few days ago, your correspondent was informed by the Saxon distributor that thirty of his agents responded to his suggestion to come to the factory in Detroit and drive away their new cars, as otherwise it might be a case of at least ten days before the cars would reach them.

From Lansing came the news that Reo dealers have already started the annual drive-away period, only because they are clamoring for cars and can't get the promise of an early delivery by rail.

The Hupp Motor Car Co., the Studebaker Corp., the Maxwell Motor Co., and others already had a few drive-aways and will have more from now on.

The Charles E. Reiss Co., New York distributor for the Hupmobile will have its cars shipped only as far as Poughkeepsie, N. Y., from where the cars will be driven overland. Some shipments may also be coming by lake steamer to Buffalo, from where there will then be a drive-home.

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New Bus Bodies Much Improved

NEW YORK CITY, Feb. 22—The new metal bodies designed and built by the Fifth Avenue Coach Co. for application to its bus chassis are being installed in place of the old ones at the rate of one every two days. The new bodies are 800 lb. lighter than the twenty-four-passenger bodies formerly used, yet they seat ten more persons. They are even lighter in comparison with the forty-five passenger bodies used on other of the chassis.

The new bodies are being equipped with Perfection exhaust heaters, made by the Perfection Spring Co., Cleveland, Ohio. These heaters will use all of the exhaust and while in use will eliminate the silencer. A new type of sign is being developed which is more legible than the former type, it is more accessible for adjustment and it is expected that both front and rear signs will be used when the latter are perfected.

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Sheridan Truck Motor 2¾ by 4 In.

NEW YORK CITY, Feb. 19—In THE AUTOMOBILE for Jan. 22 a typographical error made it appear that the four-cylinder motor of the Sheridan light truck built by the Sheridan Commercial Car Co., Chicago, Ill., was 2 by 4 in. This should have been 2¾ by 4 in.

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Now Continental Motor Co.

DETROIT, Feb. 17—At the stockholders' meeting of the Continental Motor & Mfg. Co., it was decided to shorten the name of the company which will hereafter be Continental Motor Co.

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat.	Week's Ch'ge
Aluminum	.56	.57	.57	.57	.57	+ .01
Antimony	.44	.44	.44	.44	.44	...
Beams and Channels, 100 lb.	2.17	2.17	2.17	2.17	2.17	...
Bessemer Steel, ton	34.00	34.00	34.00	34.00	34.00	...
Copper, Elec., lb.	.27½	.27½	.27½	.28½	.28½	+ .01
Copper, Lake, lb.	.27½	.27½	.27½	.28½	.28½	+ .01
Cottonseed Oil, bbl.	9.40	9.70	9.60	9.65	9.65	+ .25
Cyanide Potash, lb.	.28	.28	.28	.28	.28	...
Fish Oil, Menhaden, Brown	.53	.53	.53	.53	.53	...
Gasoline, Auto, bbl.	.23	.23	.23	.23	.23	...
Lard Oil, prime	.95	.95	.95	.95	.95	...
Lead, 100 lb.	6.30	6.30	6.30	6.30	6.30	...
Linseed Oil	.74	.74	.74	.75	.75	+ .01
Open-Hearth Steel, ton	35.00	35.00	35.00	35.00	35.00	...
Petroleum, bbl., Kansas, crude	1.30	1.30	1.30	1.30	1.30	...
Petroleum, bbl., Pennsylvania, crude	2.35	2.35	2.35	2.35	2.35	...
Rapeseed Oil, refined	1.05	1.05	1.05	1.05	1.05	...
Rubber, Fine Up-River, Para	.79	.79	.80	.78	.76	— .03
Rubber, Ceylon, First Latex, Crepe	.89	.89	.90	.92	.91	+ .02
Sulphuric Acid, 60 Baume	2.00	2.00	2.00	2.00	2.00	...
Tin, 100 lb.	42.00	42.00	42.00	42.13	42.13	+ .13
Tire Scrap	.06¼	.06¼	.06¼	.06½	.06½	+ .00¼

Factory Miscellany

Michigan Truck Adds—An addition, 32 by 100 ft., is being put up at the plant of the Michigan Truck & Lumber Co., Holly, Mich.

Dunlop Tire Adds—The Dunlop Tire & Rubber Co., Toronto, Ont., will immediately commence the erection of an addition to its plant.

Motor Truck Body Co. to Build—The Motor Truck Body Co., Detroit, Mich., is constructing a one-story, 64 by 245-ft. factory in that city.

Ajax to Build—The Ajax Rubber Co., Trenton, N. J., has taken out a permit for the erection of a three-story brick and steel plant to cost $75,000.

Fleetwood to Add—The Fleetwood Metal Body Co., Fleetwood, Pa., has increased its capital from $25,000 to $115,000, and plans to increase its business in proportion.

Murray Parts Co. to Add—The J. N. Murray Mfg. Co., Detroit, Mich., manufacturer of automobile parts, will construct an addition to its plant costing approximately $10,000.

To Make Tractors—The Bettendorf Trailer Co., capitalized at $100,000, has been formed to build tractors in Bettendorf, a manufacturing center near Davenport ,Iowa. J. W. Bettendorf is president of the company.

Packett Co. Formed—The Packett Motor Car Mfg. Co., St. Paul, Minn., has been formed with a capital of $150,000 to manufacture a light delivery truck and will build a factory. Henry Orme is president of the company.

Fisher Body in Krit Plant—The plant formerly occupied by the Krit Motor Car Co., Detroit, Mich., has been leased by the Fisher Body Co. and is now one of this concern's local manufacturing branches. About 150 men are on the payroll now.

Howe Rubber Adds—The Howe Rubber Co., New Brunswick, N. J., advises that on account of the protracted delay of 3 or 4 months before it could rebuild its tube plant, which was destroyed by fire at a reported loss of $150,000, it has decided to put up a concrete addition to its new tire department and move its tube business into that building. It plans to start operations in the new building about March 1.

Ford Community at Milwaukee—A Ford community is being built around the new Ford branch plant at Prospect Avenue and Kenilworth Place, Milwaukee, Wis. The latest addition is a banking institution, known as the East Side Bank, which is incorporated with $25,000 capital, and will open about March 1 at Farwell and North Avenues, a block from the Ford works. The bank will cater to employees.

To Make Electrical Apparatus—The Lake Superior Electrical Co., Superior, Wis., organized by M. B. Benson, E.E., to manufacture electrical apparatus, signal devices and similar appliances, has started operations in leased quarters in the plant of the Superior Iron Works. The initial force consists of forty-five skilled electricians. The new company has established a storage battery department and has installed a complete battery charging outfit for the convenience of Superior motorists and electric owners.

The Automobile Calendar

Feb. 19-26	Newark, N. J., Show, First Regiment, Armory, C. G. Fitzgerald, Mgr.
Feb. 19-26	Harrisburg, Pa., Show, Emerson-Bruntingham Co.'s Bldg., Capital City Motor Dealers' Assn.
Feb. 20-27	Grand Rapids, Mich., Show, Klingman Furniture Exhibition Bldg., Automobile Business Assn.
Feb. 21-26	Anderson, Ind., Show, Anderson Automobile Dealers' Assn.
Feb. 21-26	Bridgeport, Conn., Show, State Armory, B. B. Steibler, Mgr.
Feb. 21-26	Louisville, Ky., Show, First Regiment Armory.
Feb. 21-26	Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 21-26	Portland, Me., Show, Exposition Bldg.
Feb. 21-26	South Bethlehem, Pa., Show, Coliseum. J. S. Elliot, Mgr.
Feb. 21-26	Tacoma, Wash., Show, Tacoma Automobile Club, Glide Rink. C. A. Collins, Mgr.
Feb. 21-26	Syracuse, N. Y., Show, Syracuse Automobile Dealers.
Feb. 21-26	Reading, Pa., Show, Berkshire Hotel.
Feb. 23-26	Bay City, Mich., Show, Bay City Automobile & Accessory Dealers' Assn.
Feb. 28-March 3	Pittsburgh, Pa., Convention of American Road Builders' Assn., Mechanical Hall.
Feb. 28-March 4	Utica, N. Y., Show, Utica, Automobile Bldg., Utica Automobile Trade Assn.
Feb. 28-March 4	Cedar Rapids, Ia., Show, Cedar Rapids Automobile Dealers' Assn.
Feb. 28-March 4	Paterson, N. J., Fifth Annual Show, Auditorium.
Feb. 28-March 4	Shamokin, Pa., Show, Shamokin Automobile Show Assn.
Feb. 29-March 4	Ft. Dodge, Iowa, Show, Terminal Bldg., Ft. Dodge Automobile Dealers' Assn.
March	Danville, Ill., Show.
March 5	Los Angeles, Cal., Speedway Race, Ascot Speedway Assn.
March 4-11	Boston, Mass., Car and Truck Show, Mechanics Bldg.
March 8-11	Davenport, Iowa, Show, Tri-City Davenport, Rock Island & Moline; Tri-City Automobile Trade Assn.
March 8-11	Mason City, Iowa, Show, Armory.
March 8-15	Brooklyn, N. Y., Show, Brooklyn Motor Dealers' Assn.
March 9-11	Kenosha, Wis., Show, Kenosha Retail Assn., Kenosha Farmers' Session.
March 11-18	Boston Automobile Show, Mechanics Bldg.
March 15-18	Trenton, N. J., Show, Armory, under auspices of Chamber of Commerce.
March 21-25	Deadwood, S. D., Show, Auditorium. Deadwood Business Club.
March 25-Apr. 1	Wheeling, W. Va., Show, Market Auditorium.
March 27-Apr. 1	Zanesville, Ohio, First Annual Southeastern Show, Airdome.
March 28-April 3	Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
April 8	Corona, Cal., Race.
April 10-15	Seattle, Wash., Show, Arena.
April 15	Altoona, Pa., Pennsylvania State Motor Federation.
Apr. 26-May 6	Oakland, Cal., First Annual Pacific Coast Motor Power & Automobile Show, Automobile Industries Assn.
May	Chicago, Ill., Speedway Race for Amateurs, Speedway Park Assn.
May 6	Sioux City, Ia., Speedway Race, Sioux City Speedway Assn.
May 13	New York City, Vanderbilt Cup, Sheepshead Bay Speedway Race.
May 30	Tacoma, Wash., 100-Mile Speedway Race, Tacoma Speedway Assn.
May 30	Indianapolis Speedway Race.
May 31	Minneapolis, Minn., Speedway Race.
June 10	Chicago Speedway Race.
June 28	Des Moines, Iowa, Speedway Race.
July 2-6	Detroit, Mich., World's Salesmanship Congress, Detroit Board of Commerce Bldg.
July 4	Tacoma, Wash., Speedway Race, Tacoma Speedway Assn.
July 4	Coeur D'Alene, Idaho, Race Meet, Hilles-Riegel.
July 4	Minneapolis 300-Mile Speedway Race.
July 4	Sioux City Speedway Race.
July 15	Omaha, Neb., Speedway Race.
Aug. 5	Tacoma Speedway Race, Tacoma Speedway Assn.
Aug. 18-19	Elgin Road Race.
Sept. 4	Des Moines Speedway Race.
Sept. 4	Indianapolis Speedway Race.
Sept. 16	Providence Speedway Race.
Sept. 30	New York City Sheepshead Bay Race.
Oct. 7	Omaha Speedway Race.
Oct. 14	Chicago Speedway Race.
Oct. 19	Indianapolis, Ind., Race, Indianapolis Motor Speedway.

The Week in the Industry

Hillman Resigns from Willard—M. G. Hillman, district sales manager in Detroit for the Willard Storage Battery Co., Cleveland, Ohio, has resigned.

Fisher is Steinhart Manager—Walter M. Fisher, formerly manager of the Cadillac Co. of Illinois, has been appointed manager of the E. W. Steinhart Co., Indianapolis, State distributors for the Dodge.

Townsend Resigns from Bowser—G. A. Townsend, Jr., of S. F. Bowser & Co., Fort Wayne, Ind., has resigned as advertising manager of that concern, effective March 3. He has been with the Bowser company for six years. As yet no successor has been named.

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Dealers

Philadelphia Trade News—The Braender Rubber & Tire Co. has opened a branch at 1327 Race Street, Philadelphia, in charge of W. L. Porter.

The Berrodin Rubber Co., Philadelphia, will add to its present line of tires an automobile-accessories department.

Chicago News Items—The Braender Rubber & Tire Co. has opened a branch at 1350-54 South Michigan Avenue, Chicago. This branch is in charge of W. J. Heathcock.

The McCullough Motor Supply Co., Indianapolis, Ind., has opened a branch office in Chicago and Cleveland. This company handles automobile parts and accessories.

The Joseph T. Ryerson & Son Co., Chicago, will carry Fahrig metal and fill orders to the retail trade in the territory west of and including Pittsburgh.

New York City Items—J. A. & W. Bird & Co., maker of the Ripolin enamel paint, Boston, has changed the location of its New York City offices from 66 Beaver Street to the Equitable Building, 120 Broadway.

The Elkhart Carriage & Motor Car Works, makers of the Elcar, have placed their wholesale and export business in the hands of the Kent Motors Corp., 1704 Broadway, New York City, distributor of the Marion car.

Texico Garage Capital $1,000,000—The Western Tire & Garage Co., which was recently organized in Texico, N. M., has a capital stock of $1,000,000. It has begun business, however, with a cash capital of $2,000. The big capitalization of the company gives it plenty of room for expansion. It is perhaps the largest capitalized garage concern in the United States.

Motor Men in New Roles

Bender Joins St. Louis Packard—Paul Bender, formerly European manager of the Burroughs Adding Machine Co., with headquarters at Berlin, on March 1 will join the force of the Packard Missouri Motor Co., St. Louis.

Gill Saxon Factory Manager—R. O. Gill, who has been assistant factory manager of the Saxon Motor Car Co., Detroit, has been promoted to factory manager. Before coming to the Saxon organization Gill was with the Chalmers Motor Co.

Dold Heads St. Louis Goodrich—W. C. Dold, formerly of the Kansas City Goodrich branch, has been appointed manager of the St. Louis Goodrich branch to succeed L. K. Rittenhouse, resigned. O. E. Hoerger, who has been acting manager at St. Louis, will remain as assistant to Mr. Dold.

Dyke Issues Free Supplement—A. L. Dyke of St. Louis has just issued a free supplement in two colors treating on the construction, principle, operation, care and adjustment of the Packard Twin-Six, King Eight, Willys-Knight, Ford and Maxwell. This is included free without extra cost with Dyke's 1915-16 Encyclopedia.

Holden Joins Service Truck—A. E. Holden has joined the Service Motor Truck Co., Wabash, Ind., as assistant sales manager. For over five years he was advertising and sales manager of the Double Fabric Tire Co. Previously he was connected with the sales department of the McIntyre Automobile Co., Auburn, Ind.

Nicholai Joins Leavitt—L. G. Nicholai, well known in automobile and newspaper circles on the Coast for a number of years past, is now identified with J. W. Leavitt & Co., Pacific Coast distributers for Overland and Willys-Knight. Mr. Nicholai will have charge of the advertising of this concern and Overland publicity and promotion work in the Northwest territory. His headquarters will be at San Francisco.

Bauer in Tire Business—H. A. Bauer, identified with the automobile industry for twelve years and for a long time connected with the Oakland Motor Car Co. in various capacities and finally the assistant sales manager of that company, has gone into business for himself in Detroit, having organized the Wolverine Rubber Co. He will be located at 2301 Woodward Avenue, and he will specialize in the wholesaling of automobile tires.

McCallum Joins Doehler—H. C. McCallum has joined the Doehler Die Casting Co., Toledo. He is in the sales department.

Wood Firestone Seattle Mgr.—E. R. Wood of Los Angeles has been named manager of the Seattle branch Firestone Tire & Rubber Co. C. W. Brown, retiring manager, has been made special representative on the Pacific Coast.

Pyke with N. Y. Mitchell—Harry Pyke has been made manager of the Carl H. Page Co., New York City distributor for the Mitchell. C. M. Welch has joined the sales force of that company and will assist Mr. Pyke.

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Dealers

Overland Building in 'Frisco—The Willys-Overland Co. has purchased a lot on Van Ness Avenue, San Francisco, Cal., and will immediately start the erection of a $400,000 building, which is to be used as the headquarters of J. W. Leavitt & Co., Coast distributer of the Overland car, and the Coast factory headquarters. The building will be a six-story structure with approximately 185,000 sq. ft. of floor space.

Denver Trade News—The Schwalbert-Dorris Co., a new concern, has opened a Dorris distributing agency for Colorado at 1240 Broadway, Denver.

A. C. Wagner, manager of the Wagner Garage Co., 1541 Cleveland Place, Denver, and W. H. H. Cranmer have secured the Colorado distributing agency for the Kelly-Springfield truck.

The International Rubber Co. is the new name for the Colorado Tire & Leather Co., 985 South Broadway, Denver, which manufactures rubber and leather half-soles and treads for tires.

F. J. Silbanck has opened an agency at 1541 Cleveland Place, Denver, for the Even Lite for Ford cars.

The Gessler-Williams Tyre Co., agent for Swinehart tires, has moved from 1560 Broadway, Denver, to 1312 Broadway.

The Wagner Garage, 1541 Cleveland Place, Denver, has been appointed as a Buick service station.

The C. & S. Sales Co., 1742 California Street, Denver, is a new concern manufacturing Randolph springs for distribution in the Rocky Mountain territory. F. E. Coe is president and C. R. Stedman is secretary-treasurer.

Payne Bros. have opened an International tire half-soles agency at 1560 Broadway, Denver, under the name of the International Sales Co.

Marathon Tire Enlarges at Omaha—The Marathon Tire & Rubber Co. has taken over the business of the Akron-Marathon Rubber Co., consolidating the latter with the factory office and warehouse in Omaha, Neb., enlarging their staff and facilities. The management and selling force are the same with additions. H. H. Replogle is division manager for the Middle West, with headquarters at Omaha.

Overland Builds in Kansas City—The Willys-Overland Co. has completed the purchase of the acre tract of land at Twenty-first Street and Grand Avenue, Kansas City, Mo., and will start construction work at once on a seven-story sales and storage building. The four-story building at 2110 Grand Avenue, now housing the local branch of the Overland company, will be sold, despite the fact that plans had been drawn and contracts let for its enlargement.

The proposed building will have a frontage on Grand Avenue, McGee and Twenty-first Streets, and will cost about $600,000. Work on it will probably start March 5 and be rushed so that it may be occupied in August. It will be constructed to afford a large salesroom for new cars, a salesroom for second-hand cars, a repair department with space sufficient to permit work on a hundred cars, a department in which $250,000 worth of Overland parts will be kept on hand, a paint shop, a body shop, a machine shop, a storage capacity for 500 machines and the offices of the factory branch.

The building will not be a warehouse or an assembling plant. In announcing the contemplated improvement, it was given out that the company intends to acquire a warehouse site on the outskirts of the city and that an ultimate investment will be made here of $1,500,000.

Minnesota News Items—The Maxwell Motor Sales Corp., distributer for the Maxwell car, has bought a block of land 330 ft. long at Twenty-sixth Avenue, Southeast, and Delaware Street, Minneapolis, upon which it will erect an assembling plant. The company is now at Seventh Avenue, South, and Third Street in a large building, but the new structure will be adapted to more efficient use. F. W. Warrington is district manager.

B. W. Harris, representing Harris Bros., Chicago, announces a $350,000 plant will be erected in the Midway district to make gasoline engines. The C. A. Stickney Co. plant at St. Paul was recently bought by Mr. Harris and he said either a milling concern or an automobile factory may be established there. The new plant will make gas engines of the Stickney type, will operate a repair department and manufacture several lines of machinery.

Kansas City Changes—The Western Auto Supply Co., 1426 Grand Avenue, Kansas City, has been reorganized, and Don A. Davis has been elected president and treasurer. Mr. Davis purchased half interest in the company from George Pepperdine, who still retains an ownership, but is retiring from active work on account of his health. H. R. Baker is vice-president and E. R. Baker secretary.

The Studebaker branch has moved into its new six-story distributing warehouse on the northeast corner of Twenty-first Street and Grand Avenue. The new quarters are 120 by 150 ft., with storage room for 300 cars and additional space for a showroom, shop and used car storage. In the year 1915 the Kansas City branch handled cars valued at about $4,000,000. A. W. Daley, the retail sales-manager, predicts an increase of 50 per cent for 1916.

St. Louis News Items—W. L. Hausman, secretary of the Velie Automobile Co., St. Louis, has resigned to become associated with Price, Waterhouse & Co., public accountants. Mr. Hausman also has disposed of his stock in the Velie company.

The Entz Automobile and Battery Co., St. Louis, announces that it is now the official Detroit Electric garage and Southwestern representative of the Philadelphia Storage Battery Co.

The Cartwright Motor Car Co., has moved its salesroom from 3003 Locust Street to the new building occupied by the Commercial Auto Body Co. at Sixteenth and Pine Streets. Hugh F. Cartwright is president of both companies.

The Moon Motor Car Co., St. Louis, has moved its showroom from 3003 Locust Street to larger quarters at 3040 Locust Street. Similarly the Newell Motor Car Co. of St. Louis has increased its display space considerably by moving from 308 North Twelfth Street to 3003 Locust Street.

The Imperial Motor Car Co., St. Louis, has moved from 1045 North Grand Avenue to 2000 De Kalb Street in order to obtain larger quarters.

Plans for the immediate erection in St. Louis of a $250,000 Overland branch building were announced recently by the Overland Automobile Co. of that city, which acquired a quarter of a city square on the southwest corner of Twenty-third and Locust Streets.

The Park Automobile Co., St. Louis, has opened a new sales room at 2226 Locust Street for the display of the Chalmers line.

The Steele-Morgan Motor Car Co., Euclid and Taylor Avenues, has been given the agency for the Autocar in the St. Louis district.

The St. Louis Sectional Garage Co. has been formed by Eugene H. Angert, Frank H. Sullivan and Edward W. Lake with a capital stock of $5,000 to manufacture a portable garage.

Trade News from the Northwest—Gerlinger Motor Car Co., Portland, Ore., has taken the Oregon agency for Swinehart tires. J. F. Chapman is in charge of the tire department.

The Northwest Buick Co., Spokane, has opened new quarters at 1308 First Avenue.

The Interstate Auto Co., Spokane, distributor Interstate and Velie lines, has moved into new quarters at 1223 Sprague Avenue.

Glendale Auto Brokerage Co., Tacoma, has opened at 2913 Sixth Avenue. W. G. Rowland and G. N. Bissell are proprietors.

The Sieler-Inman Auto Co., Spokane, have been organized to handle he Case automobile in the Inland Empire. The territory includes eastern Washington, northern Idaho and western Montana. Henry and Victor Seiler and Elmer Inman are members of the new firm. The salesroom and service station are located at W-1017-19 Sprague Avenue.

Auto Tire & Rubber Co., Seattle, has opened new quarters at Seventh Avenue and Pine Street. D. E. Marriott is president and treasurer. With him is now associated H. J. Holmes as treasurer of the company.

J. P. Corey of the Seattle sales staff of the Rothweiler Truck Co. has left for San Francisco, where he will look after the interests of his firm and establish a branch, and S. F. Donnell of the same company will establish a branch in Minneapolis and direct the sales campaign for Rothweiler trucks in the Middle West.

New Chalmers in Kansas City—The factory branch of the Chalmers Motor Co. here has been discontinued and the distributing agency in the Kansas City territory has been taken over by the newly-organized Chalmers Motor Co. of Kansas City. The new company is headed by Lewis T. Shelton, part owner and manager of the Packard company here. He will also continue to manage the Packard agency. E. L. Knott will be the manager of the new Chalmers company.

The Chalmers company will open a new salesroom at 1506-8 McGee Street, but will continue its service and stock depot at 1728 Walnut Street.

Gets Rainier Park Concessions—Concession for all privileges within the Rainier National Park, including transportation to the park from Tacoma, Seattle and Ashford for a period of twenty years has been granted to the Rainier National Park Co. composed of Tacoma and Seattle business men, by the Interior Department. Headquarters of the new company will be in Tacoma. The company is capitalized for $200,000. All concessions within the park with the exception of the National Park Inn have been turned over to the Rainier company.